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# POPULAR MECHANICS

★

## MAGAZINE

WRITTEN BY AND ILLUSTRATED BY

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SEE PAGE 494



# You need Balanced Gasoline

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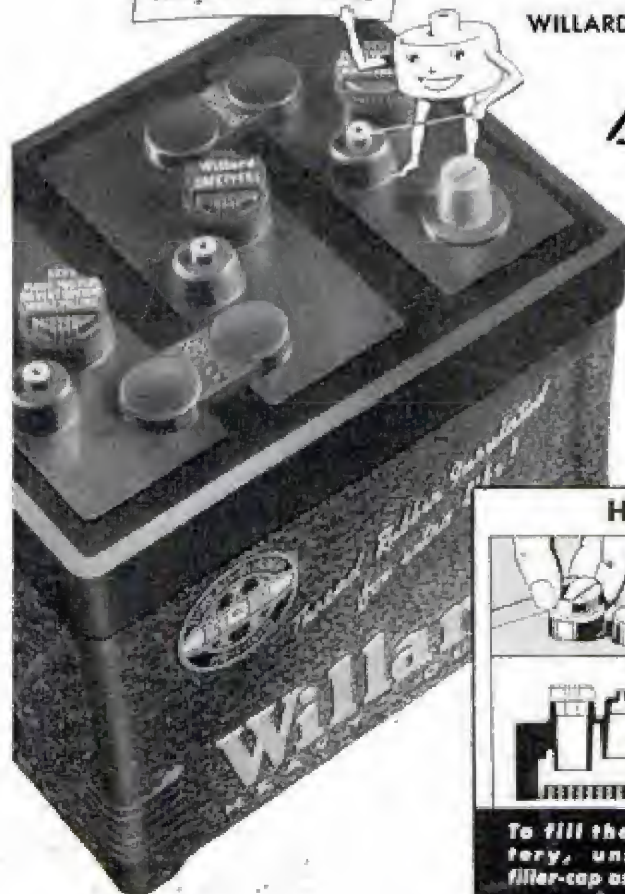
• Whenever a service man can't *see* the level of the battery solution he may accidentally over-fill your battery. Such "blindfold filling" results in dangerous corrosion because the excess electrolyte surges up through the vents in the top of the battery and attacks the wiring and exposed metal parts of the car.

Now Willard's famous "H-R" battery is built with a new and unique construction (called *Safety-Fill*) that gives positive protection against this dangerous over-filling and the corrosion that is bound to follow.

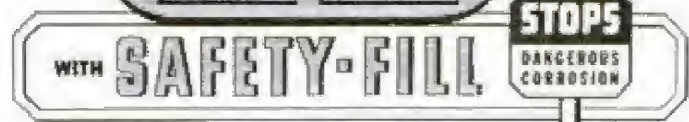
Built to last 68% longer than the average of 100 other brands—having "power-house" performance with tremendous reserve capacity—and now equipped with "Safety-Fill"—the "H-R" is the battery "buy" of the year. Have your Willard Dealer show you this exclusive new battery that simply *can't* drink too much.

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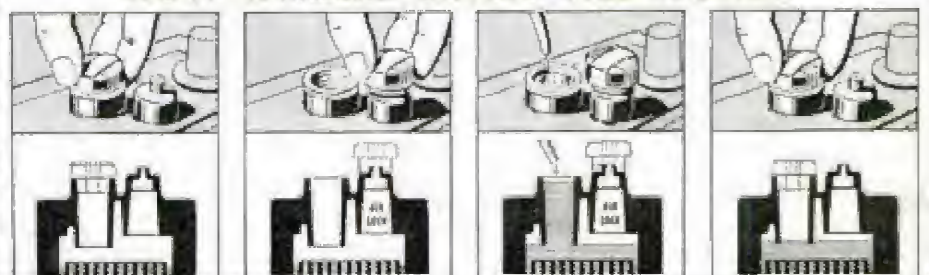
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# Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

October, 1939

Vol. 72, No. 4

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## Shooting from the Clouds

THINGS happen to an air-line photographer. One day he'll be standing on his head in a two-seater plane, clutching a thirteen-pound aerial camera while his pilot flirts with skyscrapers in maneuvering for a vertical view of the city's canyons. Next day he'll be bouncing in drafts above a forest fire or hunting the navy through holes in the clouds. Life is never dull in this sky picture business, described by Merle J. Oelke, American Airlines cameraman, in the November issue. Eight pages of Coloroto pictures include some of his own superb natural-color photographs.

## Shipwreck School for Captains

FIRE breaks out aboard a "cruise" liner. Its master is dead, the mate is in command. What is he to do in the emergency? That's a question put to ship captains and mates in the government's "Disaster College." Read in next month's issue what this school is doing to avert the tragedies that befell the "Titanic," "Vestris" and "Morro Castle."

## Next Month

SOME day this world of ours is going to crack up. If we escape a collision—and we did miss one heavenly tramp by a mere 400,000 miles two years ago—the earth will live on until millions of years hence the sun flares suddenly, or cools, or the moon flies into fragments. You won't see the world's end, but you can read in November how science thinks it will come, and you can journey with "Explorers of Space" to the moon to watch the sun's eclipse in the year 2144.

## Don't Take It So Hard

YOU can't beat gravity. Sometime it will get you down, whether it be on an icy sidewalk or a stepladder or in a slippery bathtub. But if you must fall—and 26,700 Americans were killed by falls last year—take a few tips from the circus clown and the trapeze artist on how to do it safely and comfortably. These comedians who fall just to be funny tell the tricks of their trade in the November magazine. They may save you some broken bones.

## Here's Your Cue

BILLIARDS has gone collegiate. Once the game of royalty, later in disrepute, billiards has swung into wide popularity and found a place on the winter calendar of intercollegiate sports. Anyone can have fun at it, but to become a star you must begin right. In next month's issue Charles C. Peterson, famous "pro," tells in story and pictures how to angle for better billiards.





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Second Edition

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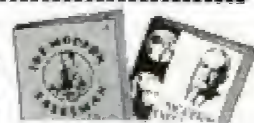
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#### IMPORTANT NOTICE

It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. We take no responsibility as to whether the disclosures contained in our articles are covered by patents and advise readers to investigate this subject before making, using, or selling any of the products, machines, or processes described, in order to avoid possible liability for patent infringement.





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| <input type="checkbox"/> Architecture                 | <input type="checkbox"/> Fire Boilers           | <input type="checkbox"/> Fruit Growing            | <input type="checkbox"/> Mechanical Engineering    | <input type="checkbox"/> Steam Engineering          |
| <input type="checkbox"/> Auto Electric Technician     | <input type="checkbox"/> Heating                | <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Mine Foreman              | <input type="checkbox"/> Steam Fitting              |
| <input type="checkbox"/> Auto Technician              | <input type="checkbox"/> Highway Engineering    | <input type="checkbox"/> House Planning           | <input type="checkbox"/> Navigation                | <input type="checkbox"/> Structural Drafting        |
| <input type="checkbox"/> Aviation                     | <input type="checkbox"/> Machinist              | <input type="checkbox"/> Management of Inventions | <input type="checkbox"/> Patternmaking             | <input type="checkbox"/> Structural Engineering     |
| <input type="checkbox"/> Boilermaking                 |   |   | <input type="checkbox"/> Pharmacy                  | <input type="checkbox"/> Surveying and Mapping      |
| <input type="checkbox"/> Bridge Engineering           |   |   | <input type="checkbox"/> Plumbing                  | <input type="checkbox"/> Telegraph Engineering      |
| <input type="checkbox"/> Building Estimating          |   |   | <input type="checkbox"/> Poultry Farming           | <input type="checkbox"/> Telephone Work             |
| <input type="checkbox"/> Chemistry                    |   |   | <input type="checkbox"/> Public Works Engineering  | <input type="checkbox"/> Toolmaking                 |
| <input type="checkbox"/> Civil Engineering            |   |   | <input type="checkbox"/> Radio                     | <input type="checkbox"/> Ventilation                |
| <input type="checkbox"/> Coal Mining                  |   |   | <input type="checkbox"/> R. R. Locomotives         | <input type="checkbox"/> Welding, Electric and Gas  |
|   |   |   | <input type="checkbox"/> R. R. Section Foreman     | <input type="checkbox"/> Woolen Manufacturing       |
|   |   |   | <input type="checkbox"/> R. R. Signalmen           |   |
|   |   |   | <input type="checkbox"/> Refrigeration             |   |

### BUSINESS SUBJECTS

- |  |  |   |  |   |                                  |
|--|--|---|--|---|----------------------------------|
| <input type="checkbox"/> Accounting              | <input type="checkbox"/> Advertising                 | <input type="checkbox"/> College Preparatory  | <input type="checkbox"/> Grade School Subjects | <input type="checkbox"/> Railway Postal Clerk   | <input type="checkbox"/> Signs   |
| <input type="checkbox"/> Bookkeeping             | <input type="checkbox"/> Cost Accounting             | <input type="checkbox"/> C. P. Accounting     | <input type="checkbox"/> High School Subjects  | <input type="checkbox"/> Salesmanship           | <input type="checkbox"/> Spanish |
| <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> First Year College Subjects | <input type="checkbox"/> Foremanship          | <input type="checkbox"/> Illustrating          | <input type="checkbox"/> Secretarial Work       |                                  |
| <input type="checkbox"/> Business Management     | <input type="checkbox"/> French                      | <input type="checkbox"/> Managing Men at Work | <input type="checkbox"/> Lettering Show Cards  | <input type="checkbox"/> Stenography and Typing |                                  |
| <input type="checkbox"/> Cartooning              | <input type="checkbox"/> Civil Service               |   | <input type="checkbox"/> Traffic Management    |   |                                  |

### DOMESTIC SCIENCE SUBJECTS

- |   |   |   |
|---|---|---|
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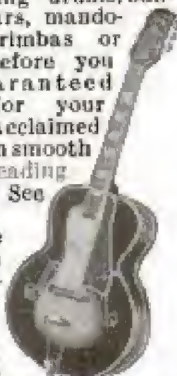
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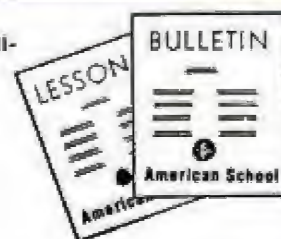
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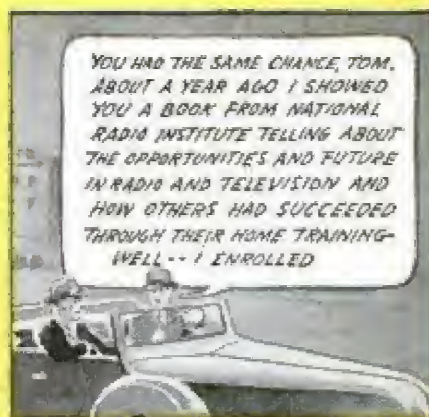
Radio broadcasting stations employ engineers, operators, station managers and pay well for trained men. Radio manufacturers employ testers, inspectors, foremen, servicemen in good-pay jobs with opportunities for advancement. Radio jobbers and dealers employ installation and servicemen. Many Radio Technicians open their own Radio sales and repair businesses and make \$30, \$40, \$50 a week. Others hold their regular jobs and make \$5 to \$10 a week fixing Radios in spare time. Automobile, police, aviation, commercial Radio; loudspeaker systems, electronic devices, are newer fields offering good opportunities to qualified men. And my Course includes Television, which promises to open many good jobs soon.

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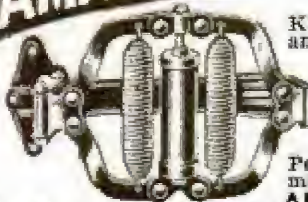
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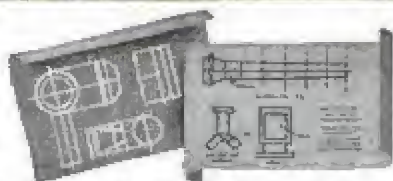
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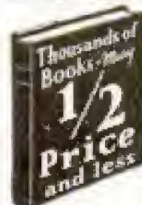
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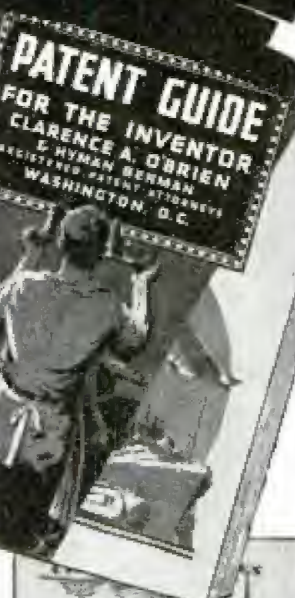
The U. S. A. is the greatest open market for new inventions in the world. Here commercial striving is so keen that the unprotected invention, if it has public acceptance, is quickly "eyed" and may become the prey of eager competition. Worthwhile manufacturers won't bear the production costs and sales expense of promoting a new invention unprotected by patent. A good, strong patent not only opens the road to marketing your invention, but closes it to would-be chiselers who may seek to reap the rewards of your creative efforts.

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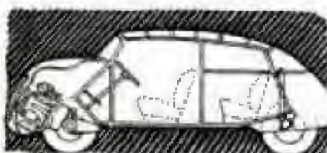
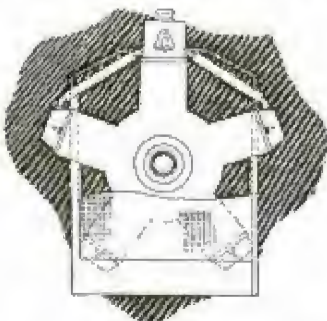
# INVENTIONS

**T**HE latest form taken by the parachute is that of a lifesaving garment that would be worn by the user. It would be attached to a belt around the chest and to



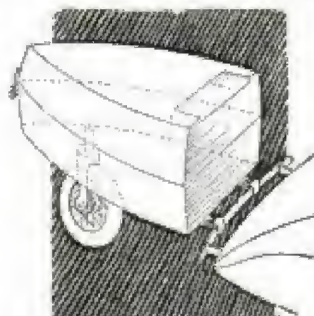
bands on the ankles. Flexible stays would help to hold the 'chute open in the air. Opening the parachute would be accomplished by simply lifting the arms.

**S**OME idea of what the automotive industry may have in mind for the automobile of tomorrow may be gained from a recent patent covering a radial engine. Issued to the Chrysler Corporation, the patent specifies an internal combustion with the cylinders arranged radially, like those used in airplanes, complete with radiator and cooling jacket. An accompanying patent covers the car in which this engine would be mounted. The engine



is to be installed on a wheel suspension, thus riding free of the body frame. The engine would be stabilized by some yieldable means coating between the engine and the body. One feature appears to be suspension of the rear wheels, and one advantage of the design seems to be a considerable saving in space required by the engine, thus resulting in more space in the body.

**W**HEN you reach an attractive camp site with a patented trailer, it may be unloaded and then unfolded to form a boat. It consists of two hinged sections, one of which is equipped with a wheel for use on the highway. A pivoted latch holds the sections together in boat formation when desired or serves as a direct drawbar when the assemblage is used as a trailer. The wheel may be removed when the trailer is converted into a boat.



**H**OLDING the bowling ball with greater ease is the objective of a gripping device patented recently. It consists of a handle, a suction cup which grips the ball and a rearwardly extending arm which helps to disengage the ball from the suction cup when desired. The attachment is expected to be a welcome adjunct to the game.



(Continued to page 34A)

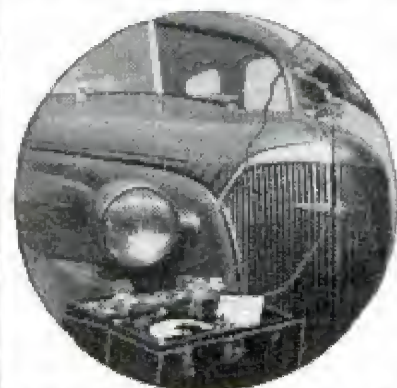


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This new electroplating outfit is as easy to pick up and carry around as a fishing tackle box.

hooks, and a lot of other messy equipment. So it was, but that vision is fading out nowadays. For a new and simple method of electroplating has been perfected, especially adaptable for use in the home, or shop, or store, or office, and in many other places, too. And therein lies a newly found way for a man to fatten his pocketbook.

Thanks to modern science, the new electroplating process does away completely with all tanks, and permits easy portability of the entire plating outfit. The process uses an electric brush and a non-liquid electrolyte.

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### How Eight Men Cashed In

And has somebody hunting for spare time dollars or full time ones for that matter, actually used the process to his profit? Listen to this:

"I got a typewriter rebuilding company to let me go over 100 machines. And then a jewelry loan company gave me an order for replating their musical instruments. I have even gone into a home to plate some faucets and made \$10.00 in three hours," says W. R. Dixon, 217 Admiral Blvd., Kansas City, Mo.

"Three pairs of automobile reflectors netted me five dollars, the plating costing seventy-five cents," remarks Francis Edwards, St. Clair, Pa.

"I have gold plated to date more than sixty rings at seventy-five cents each," reports Charles N. Valade, Tupper Lake, N. Y.

"As a watchmaker, it formerly cost me \$1.50 to have a watch dial refinished," writes Charlie M. Underwood, Turlock, Calif. "Now it costs me two cents for the compound."

"As a maker of stage props, I often had to take devices apart for plating," reports Fred Corwey, 315 West 47th Street, New York, N. Y., "but now I do not have to take them down and send the parts out, I do it on the spot."

"As a sideline I average \$20.00 a week. I put an ad in a paper. Then I arranged to pay a music store owner ten cents on every dollar of work he turned over to me. I had cards printed. I display my work and boy, does the work come in!" So reports Ray Kuhns, Cumberland, Md.

"I use my plater for work on guns and pistols, and all kinds of silverware, and have discarded my old tank," says W. E. Irby, State Line, Mass.

"By replating metal parts on a show case, I made over twice the price of my outfit in three and a half hours," declares Howard Mullorky, 119 Cornelia Street, Plattsburg, N. Y.

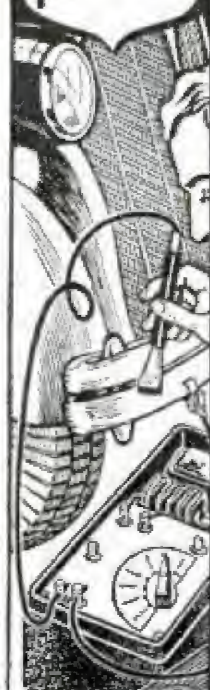
Want any more evidence, young man? There's plenty to be had. But a word to the wise—well, you know the rest of it.

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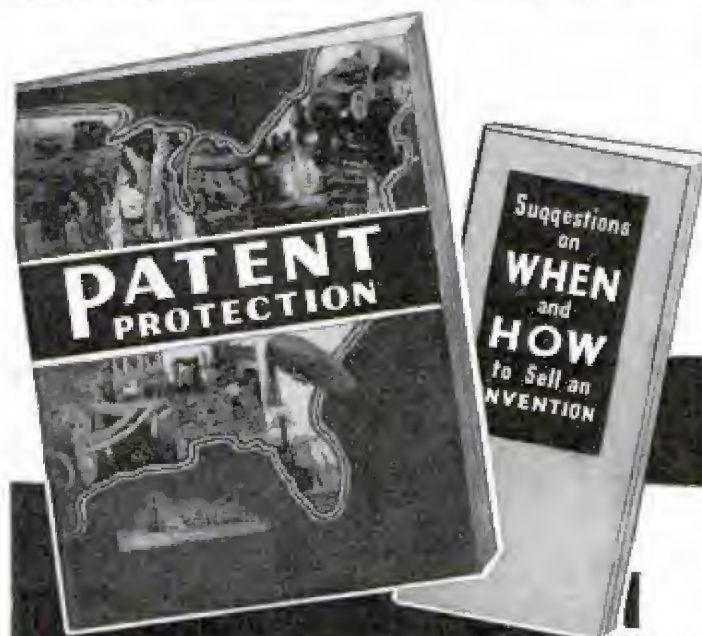
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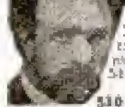
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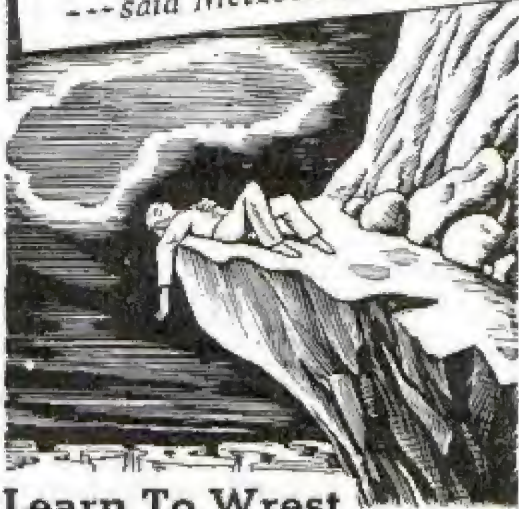


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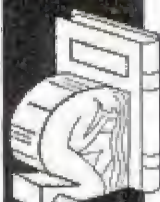
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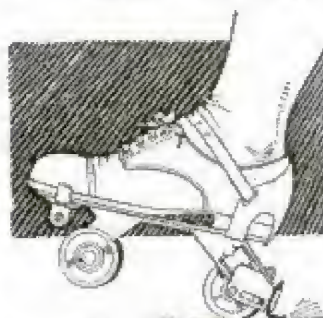
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(Continued from page 24A)

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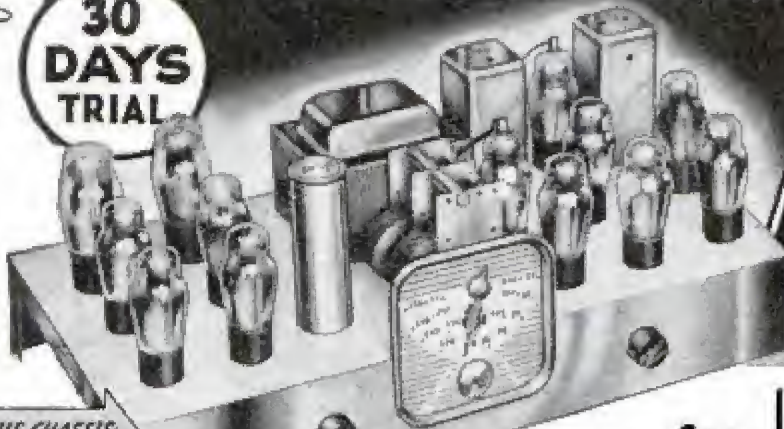
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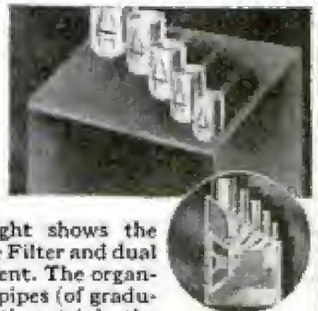
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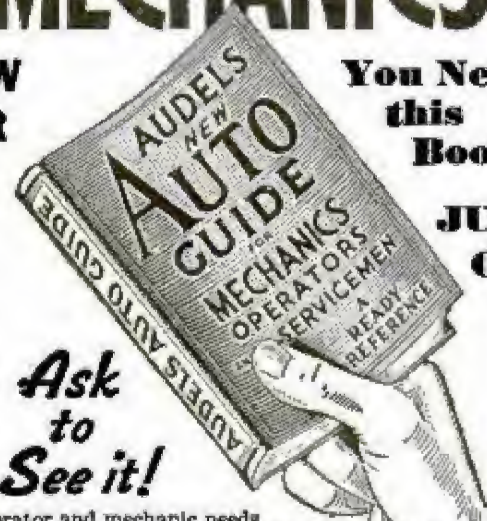
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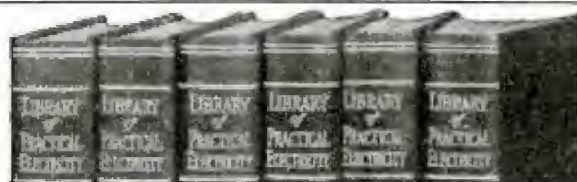
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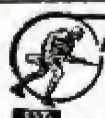
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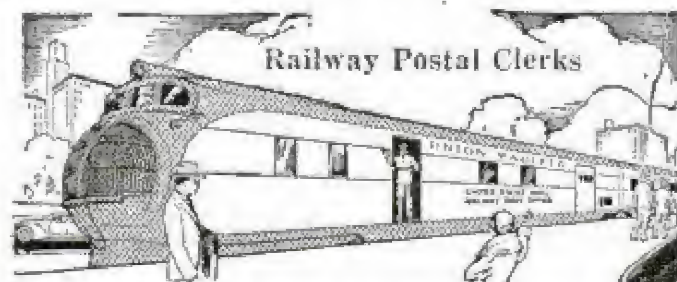
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**REFINE** Used oil without cost. Particulars, F. Gerwin, Fairview, Oklahoma.

**REWINDING** Motors and 330 other valuable articles in Shop Notes, Vol. 31—50 cents postpaid. Popular Mechanics Press, Room (C39), 200 E. Ontario St., Chicago.

**BARGAIN**—½ Hp. motors, 60 cycle, 1 phase, 110 volt, like new, guaranteed, \$7.40. Send check to Erie Electric Motor Co., 129 Church, Buffalo, N. Y.

#### MACHINERY, TOOLS AND SUPPLIES

**10" ELECTRIC** Grinder—Complete with wheel guards, two 10" Resinoid wheels, ½ hp., 3600 r.p.m., totally enclosed heavy duty repulsion induction Century motor, built-in overload switch and cord. Limited number at special price of \$43.50. Money back guarantee. Viking Manufacturing Co., Jackson, Michigan.

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**CONCRETE** Building block machines and molds. Easy payments. Catalog free. Concrete Machine Co., 5129 South Compton Ave., St. Louis, Mo.

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**YOU'LL** Like the new Atlas catalog for 1940—out this month. 72 pages crammed full of modern machine tools and equipment for home and commercial shops. Write Atlas Press Co., 1028 N. Pitcher St., Kalamazoo, Mich.

**BARGAINS.** Demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Hobart Welder Exchange, Box M-1094, Troy, Ohio.

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**BARGAIN** List on repossessed and sacrificed standard lines power tools and light machinery. Bill Bailey, Box 236, Columbus, Ohio.

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**PLASTICS.** Brass, aluminum, Dowmetal, monel, stainless steel, gears, etc. Catalog 10c. Hobby Supply House, Box 2014, Pittsburgh, Penna.

**DRILL** Grinding attachment fits bench grinder, hand or power turned. Handles sizes 3/16 to 1½". Price \$7.85. Descriptive literature on request. Tractor-Lite Co., Sidney, Iowa.

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**BUILDING** Plans 8' plywood fast outboard, August Rudder 35c. Catalog boat plans free. Rudder, 15 Murray St., New York.

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**MARINE Power—Easily convert any Ford motor (domestic and foreign) with Osco parts and kits. Complete catalogue 25c (coin). Osmithson, 3644 Lawrence St., Philadelphia, Penna.**

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**NORTHERN Coonhounds.** Terms. Price-list, description (dime). Lakeland Fur-exchange, Salem, Michigan.

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**VILLAGE Farm, lake view, 6 acres on gravel road, depot and advantages at hand, short drive to city; creek, variety fruit, good 6-room house, electricity, hen house 18x80; exceptional at \$750 including furniture; \$300 down; page 93 free 100-page catalog.** Strout Realty, 255-P 4th Ave., New York City.

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**RAISE Mink for profits.** Free information. Eugene Hollis, Greenville, Ill.

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**105 PICTORIALS**. Airmails, triangles, diamonds, from Greenland, Belgium, Cuba, Mexico, Ecuador, etc., for 10c to approval applicants. Falk, Inc., Box 522, Jacksonville, Florida.

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**175 U. S. commemoratives**, etc., 10c. 500 25c. P. O. Box 457, Newark, N. J.

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**WORLD'S** Smallest airmail, largest map, also diamond and triangle magnifier to study your stamps, with large packet from scarce countries. Only 5c with approvals. Capital Stamps, Dept. 2, Little Rock, Ark.

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**COINS** Are profitable. Catalogue of coin bargains and uncirculated coin—10c. Illustrated buying book—25c. Eugene Morrison, Reseda, California.

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**CENT** Buying, selling, list 5c. 1933-D 5c, paying 3c. M. Mayrath, Dodge City, Kans.

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**1939 AMERICAN** Coin catalog and complete mint record. Prices all United States coins. 50c postpaid. 1933 edition 25c. D. M. Merrin, Box 565, Spokane, Wash.

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**COMMEMORATIVE \$1's**, Five different, uncirculated, \$5.00; United States large cents, 1800, 1801, and 1802, \$1.00; packet 30 coins of 30 different countries \$1.00. Koeppl's Coin Shop, Eighth Corner Broadway, Los Angeles.

**UNCIRCULATED** San Francisco mint cent and catalog 10c. 3 dates 25c. Landon, 901 Lucerne, Los Angeles.

**COIN Collections**. Gold coins, 55% premium. A. French, Rte. 1, Troy, N. Y.

**GET Profit** and pleasure in collecting old coins. Send 10c for 56-page illustrated coin catalog. You'll be delighted with it. Send for it now. B. Max Mehl, 370 Mehl Bldg., Fort Worth, Texas. Largest rare coin establishment in U. S. Established 38 years.

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**FREE!** Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-125, Mass.

**\$5 To \$500** Each paid for hundreds of old or odd coins. Keep all until posted. Many very valuable. Send 10 cents for illustrated Coin Value Book, 4x6. Guaranteed buying and selling prices. 31 years in business. Coin Exchange, Box 5, Le Roy, N. Y.

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**HOLLYWOOD** Match covers included collection 110 all different \$1.00. Cover-service. Fellows, Calif.

**WANTED** Old cigarette cards. Write Bray, 1127 Jackson, Easton, Penna.

**UNUSED** Book match covers, 100 all different. \$1.00. Free list. Charles Edelman, 1311C East 84, Cleveland, Ohio.

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**ROLL** Developed 2 prints and two enlargements 25c. Beautiful photographic Christmas cards or calendars from your negatives, 4 for 25c; 17, \$1.00, envelopes included. Young Photo Service, 405-C, Albany, N. Y.

**ROLL** Developed, 8 prints and 5x7 enlargement 25c. Saunders, Box 8E, Glenview, Ill.

**PERFECT** Enlargements, 5x7, 10 cts; 8x10, 20 cts. Send negatives. Photo Print, Box 184-M, Duncan, Okla.

**ROLL** Developed, 2 prints each negative 25c. Enlargement coupon, 16 reprints 25c. Artcraft Studios, Box 3580-A, Cleveland, Ohio.

**ROLL** Developed 8 Photo Art prints, one 5x7 enlargement, 25c coin. Roxy Photo Service, 7727 Ridge, Philadelphia, Penna.

**PHOTO Mill**. Immediate service! No delay! Roll developed, carefully printed and choice of two beautiful 5x7 professional enlargements, one tinted enlargement, or eight reprints—for 25c coin. Reprints 2c each. The Photo Mill, Box 629-12, Minneapolis, Minnesota.

**35MM—36** Exposure rolls fine grain developed, 36 2 1/4"x3" enlargements, cartridge reloaded with Agfa Superpan Supreme film, all for \$1.50. Bates Photo Service, Box 116, Big Flats, N. Y.

**BETTER** Photo finishing. Eight exposure rolls developed and printed 25c. Moore Studios, Alstead, New Hampshire.

**16 OVERSIZE** Deckled-edge prints from roll 25c. Artshop, Weatherford, Oklahoma.

**35MM** Rolls developed free. Prints enlarged 3 1/4"x5. Maximum charge \$1.00 at 4c print—refund on nonprintables. Regular rolls—8 professional prints—2 enlargements 25c coin. Quality guaranteed. One day service. Filmaster, Dept. 101, South Bend, Indiana.

**ROLL** Films finished (to size 122) 2 sets prints (limit 16), one enlargement 25c coin. Fine album free to steady customers. Brilliant Photo Service, Box 916, Boise, Idaho.

**MINICAMISTS**, 3 Months free subscription "Photoshop Messenger." Write Photoshop, Linton, Ind.

**TWO** Prints from each picture on your roll 25c. Your pictures will speak volumes when finished by our expert craftsmen. One day service. Nineteen years experience. Lens Photos, Dept. J-4, Janesville, Wis.

**PHOTOGRAPHY** For pleasure and profit. Prepare for profitable business or fascinating hobby at home. Previous experience unnecessary. Common school education sufficient. Write for information and requirements. American School of Photography, 3601 Michigan Ave., Dept. 3457, Chicago.

**TWO** Beautiful enlargements, 8 sparkling prints, 25c. Guaranteed. Lake Photo Service, D-742, LaCrosse, Wisconsin.

**ROLLS** Developed and printed, 2 free 5x7 enlargements, 25c coin. National Capital Photofinishers, 1205 Wisconsin Ave., Washington, D. C.

**OIL** Coloring photographs a fascinating hobby or profitable business. Learn at home by easy simplified method. Previous experience unnecessary. Common school education sufficient. Send for free information and requirements. National Art School, 3601 Michigan Avenue, Dept. 3437, Chicago, Illinois.

**20 REPRINTS** 25c, 100 Reprints \$1. Roll developed with 16 prints 25c. Nord-skov, 4, Maywood, Ill.

**FREE** Album and negative file and 2 enlargement coupons with each roll developed, 8 guaranteed prints 25c. Membrane Studios, General P.O. Box 666, Dept. "K," New York.

**BETTER** Colored enlargements, 5x7, 25c. Catlin Film Service, Catlin, Illinois.

**MAIL** Roll and 25c, receive 16 Velox prints; 20 reprints 25c; two 8x10 glossy enlargements 25c. Seabrook Photos, Franklin, Penna.

**ENLARGEMENT** From each picture on your roll 25c. Cut Rate Photos, Dept. B-4, Janesville, Wis.

**TEN** Cents coin and this ad. Developing any roll and eight beautiful panel prints. Surprise, Trial, Graphic Art Studios, Box 660-35, Jackson, Michigan.

**EMBOSSED** Christmas cards, including envelopes, from your own negative 60c dozen. Minimum 4 for 25c. Film Capitol Service, Box 504, Rochester, New York.

**NOW!** Quality finishing. Instant service. Eight Velox prints, two enlargements, 25c coin. Snap Shop, 12, LaCrosse, Wis.

**ROLLS** Developed, 8 prints, two snappy chromium finish enlargements 25c. Prompt 6 hour service. The Picture Folks, Lincoln, Nebr.

**FIRST** Roll developed—Beautiful 5x7 enlargement and 16 prints, 25c. Dick's Photo, A-10, Louisville, Kentucky.

**ONE** Day service—8 dated lifetime prints and 2 doubleweight enlargements, 25c. Satisfaction guaranteed. Send your favorite negative for free sample picture, handy mailing envelope and brochure of "Ideas" for kodakers. Supertex Photo Service, Dept. M4, Box 1166, Dallas, Texas.

**LARJARGRAPH** Reprints: Five 5x7 enlargements 25c. Cardinal Photos, Summit, N. J.

**FOR** The discriminating amateur—Rolls developed 2 prints each, 25c. Reprints 3c. Superior workmanship. Same day service. Paramount Co., 327 E. 92nd St., New York.

**ROLL** Developed 16 Velox prints 25c. Radio Photo, 2509 North 3rd, Milwaukee, Wisconsin.



**ROLLS** Developed—Eight prints, two 5x7, 20c. 25 reprints 25c. Sural Photo Company, AG-3306 Potomac, Chicago.

**35MM FILMS** Developed and enlarged 3½x5—\$1.00. Better Pictures, 2143 Faragut, Chicago.

**PHOTOGRAPHIC** Christmas cards. New style sensation. 20 for \$1.00. Sample 10c. Seascout Service, Box 52, Chelsea, Mass.

**35MM. ROLLS** Developed free. 3½x5 enlargements, 36 exposures \$1.00, 18 exposures 60c. Reprints 4c. Send roll and money today. Minipix, Dept. 510, 100 N. LaSalle, Chicago.

**EIGHT** Silvertone gloss enlargements or eight prints and two enlargements, 25c. Mayfair, Box 261-K5, Toledo, Ohio.

**POTO-CARDS**—First step to a better job! Glossy photographic business cards with your picture, name, address, line of work, set in type, present useful information about yourself in handy form. 25 for \$1.00, 100 for \$2.50. Mail photo (any size), name, etc. (please print), with remittance (no stamps). Satisfaction guaranteed. Studio Press, P.O. Box 355, Chicago, Ill.

**IMMEDIATE** Service! Better pictures. Sixteen guaranteed prints from roll, 25c. One colored or two plain enlargements and 8 guaranteed prints, 25c coin. Special! Coupon for 8x10 enlargement given with every 35c worth Kodak finishing. Any 36 exposure, 35 mm. film fine-grain developed and each good negative enlarged to 3x4 prints for only \$1.00. 3x4 reprints, 4c each. One day service. Details and mailers free on request. American Studios, Dept. 22, LaCrosse, Wis.

**ROLL** Developed and eight guaranteed professional prints including two enlargements that will not fade 25c (coin). California Film Service, Box 379, Pasadena, California.

**TWENTY** Reprints 25c. Roll developed and two prints each negative, 25c. Send for free mailing envelopes, price list. Star Photos, J-109 N. Dearborn, Chicago.

**THE Modern Finishers**, St. Paul, Minnesota, are the outstanding finishers in America for low prices with quality pictures. Our modern methods give quick service and bright guaranteed neverfade pictures. Roll developed, 10 modern tone prints, 25c coin, 16 modern tone reprints, 25c. Enlargement coupons. Join our thousands of satisfied customers by sending us your next roll or reprint order. Modern Finishers, St. Paul, Minnesota.

**JOIN** The thousands who are changing to Willard's Brilliantone prints—the style leaders of 1939. Roll developed, two prints each negative, only 25c. Valuable enlargement coupon. Willard Studios, Box 3535-A, Cleveland, Ohio.

**TECHNIFINISH**—35mm. 36 Exposure rolls perfectly enlarged to 2½"x3½" glossy prints—75c. Cartridge reload with Eastman Plus X—25c. Fast satisfactory service guaranteed. Write for postpaid mailing bags and information. Technifinish Laboratory, 110 Lexington, Rochester, N. Y.

**ROLL** Developed, 16 guaranteed prints, 25c. Smart Photo, Winona, Minnesota.

**PROMPT** Service—Guaranteed work. Two beautiful portrait type doubleweight enlargements, eight neverfade gloss prints, each roll 25c. Dubuque Film Service, Dubuque, Iowa.

**EXPERT** Finishing. One day service. Rolls developed 16 Velox prints or 8 Velox prints, 2 enlargements 25c. Expert Studios, LaCrosse, Wisconsin.

**PROMPT** Service—Quality work; 2 beautiful doubleweight gloss enlargements, 8 guaranteed neverfade prints each roll, 25c. Excel Photos, Dubuque, Iowa.

**ROLL** Developed, 16 prints 25c. Wilkes-Barre Photo Service, Box 64, Wilkes-Barre, Penna.

**ONE** 6½"x8½" Wide border embossed enlargement or one 5x7 hand colored enlargement with each roll developed and 8 prints 25c. 36 exposure roll developed and 36 3½"x4½" enlargements \$1.35. 18 exposure roll 75c. Vidor, 321-P Hennepin, Minneapolis, Minn.

**ROLLS** Developed, two prints each and two free enlargement coupons, 25c; reprints, 3c each; 100 or more, 1c. Summers' Studio, Unionville, Mo.

**THREE** Prints each good negative in roll 25c. Reprints 3c. Fred D. Eastman, Bode, Iowa.

**LIFE** Photo finishing lasts a life time. Roll developed, 8 prints, 2 enlargements 25c. Reprints 1½c. Life Photos, Hutchinson, Kansas.

**ROLL** Developed and 8 beautiful Velox glossy prints 25c coin or stamps. Reprints 3c each. Fotoprint Service, Roanoke, Va.

**20 REPRINTS** 25c. 100 Reprints, \$1.00. Films developed, 2 prints each negative, 25c. Mercury Studios, Box 522-B, Chicago.

**PROMPT** Service! Rolls developed, two Velox prints each negative 25c. Hench Studios, Harrisburg, Penna.

**PHOTO** Mill. Immediate service! No delay! Roll developed, carefully printed and choice of two beautiful 5x7 professional enlargements, one tinted enlargement, or eight reprints—for 25c coin. Reprints 2c each. The Photo Mill, Box 629-12, Minneapolis, Minnesota.

**TWO** Glossy enlargements. 1 colored with roll 25c. Arbor Service, 10, Joliet, Ill.

**CANDID** Special. 35mm. rolls enlarged to 3½"x4½", \$1.00. 18mm. rolls 50c. 3½"x4½" reprints 3c. Brown Photo Company, 1910-61 Emerson, Minneapolis, Minn.

**10 PRINTS** With roll 25c. 16 reprints 25c. Rex Photo, Ogden, Utah.

**GUARANTEED.** Roll developed, 16 prints 25c. 20 prints 25c. Quality Photo, Hutchinson, Kansas.

**QUICK** Service—Rolls developed, 8 guaranteed prints; 2 enlargements; 25c coin. OK Photo Service, Ottawa, Kansas.

**100 STAMP-SIZE** Photos copied from any snapshot or photo, \$1.00. Ideal Service, Park Ridge, Ill.

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**40-70% SAVINGS** On used and new quality cameras. 90 different types and sizes. Guarantee! Trade-in. Ask for free booklet "PM2." Brenner Photo Co., 943 Pennsylvania Avenue, N. W., Washington, D. C.

**DEVELOP** Pictures the easy way! New book "Modern Developing Methods" helps beginners make first pictures, good pictures—shows advanced photographers new and better methods. 96 pages of latest information on how to develop superior prints and fine grain negatives. Scientifically accurate, yet easy to understand. Illustrations by famous photographers. The biggest value in money saving facts ever offered. Only 50 cents! Send coin, stamps or money order for your copy now! The Edwal Laboratories, Inc., Dept. 10PM, 732 Federal St., Chicago, Ill.

**AMAZING** Introductory offer. Free developing outfit with each camera at special price of \$1. postpaid. Johnson, 431 Audubon Ave., New York City.

**100 MARKETS** For your snapshots and photographs. Booklet 25c. Williams, 261 Butler, Pittston, Penna.

**MAKE** Money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 3431, Chicago.

**CAMERAS.** Enlargers, on time. See advertisement under Motion Pictures. Mogull's.

**MAKE** Money selling snapshots. Dime brings 152 page complete instruction book, buyers real information. Fomo Publishers, Canton, Ohio.

**CASH** For used cameras. What have you? Sanderson's, Ottawa, Illinois.

**AMATEUR** Photographers—I average \$10.00 a day with my \$3.00 camera, and so can you! Learn my secret for only \$1.00. M. G. H., 26 Howard St., E. Braintree, Mass.

**SAVE** On photo paper! Glossy contact 2½"x4—50c gross; smooth matte enlarging 5x7—\$1.00 five dozen; \$2.00 gross. Amazing bargains in guaranteed used cameras. Free bulletin. Standard Camera Exchange, 509 Fifth Avenue, New York.

**NEW** Free photography book now ready—lists and illustrates hundreds of sensational new and used bargains plus valuable information on modern photographic methods, high-speed miniature candid cameras, precision lenses, night equipment, enlargers, darkroom equipment, movie cameras, screens, etc. Money-back guarantee. Liberal trade-in allowance on your old equipment. Get free book today. Write Central Camera Co., Dept. 116Z, 230 South Wabash Avenue, Chicago, Illinois.

**CAMERA** Repairing! Bellows made to order—any size! Fit all standard cameras! All makes shutters repaired by experts! Lowest prices! For complete information write, United Camera Company, Inc., A-1515 Belmont, Chicago.

**BASS** Inventory clearance. Profit by these unusual bargains. 35 mm. Candid Midget, F:4.5 lens, \$12.50. Used Foth Derby, F:3.5, \$15.75. 2½"x3½" Agfa Film Pack and plate, with F:6.3 lens, auto shutter, film adapter and holder, \$11.95. Used Argus, F:4.5 lens, \$7.75. New Candid Midget, Xenon F:2 lens, Rapid Compur and case, \$84.75 value, at \$47.50. Hundreds of other bargains in the great Bass Bargaingram and special bulletins. Your money back is unsatisfactory after 14 days trial. Write Bass Camera Company, Dept. AG, 179 W. Madison St., Chicago, Illinois.

**HAVE** You a camera? Send ten cents for recent number of our big magazine, showing how to make better pictures and earn money. American Photography, 116 Camera House, Boston, 17, Mass.

**FREE** To camera owners: Set of 3 filters for names and addresses of 3 camera owners. Photo-Craft, Dept. MC, Canton, Ohio.

**ENLARGER** \$1.59. Enlarges eight times size of small negatives. Fully guaranteed. Paramount Sales Company, 89 Dudley Street, Boston, Mass.

**CAMERAS** Films, paper 25% to 35% discount. Paramount Photo Division, 327 East 92nd St., New York.

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**START** Your own road show. Earn big money. Operate movie shows in theatreless communities. Small investment. We rent and sell 16 mm. talking pictures and complete projection equipment. Write today. Southern Visual, 494 South Second Street, Dept. P.M., Memphis, Tenn.

**GENERA** Films in bulk for all motion picture cameras. 90 feet for Univex, \$1.00. 100 feet double 8mm., \$1.75; 16mm., \$1.35. 400 feet 16mm. \$4.25 postpaid. Sample for stamp. Process with our prepared powders and simplified outfits: 8mm. \$3.75. 16mm. \$4.95. Fromaders, Davenport, Iowa.

**MOGULL'S** Has real photographic bargains! "Bargainews" (largest of kind sent free!) Leica f:3.5 \$44.50; Retina f:3.5 \$29.75; Exakta f:3.5 \$47.50; movies—16mm. DeVry f:3.5 \$19.95; 8mm. Univex \$4.99. Special flash! \$410 Duplex 16mm. sound projector, 750w, 15w output, complete \$289.50. Used 16mm. sound films: features, shorts, \$5.00 per 400'; silent \$3.00 per 400'. 1100 thrilling specials. Nationwide monthly payments. Trade-ins accepted. Mogull's, 64 West 48th, New York City.

**OUTDOOR** Film 100 ft. 16mm. \$1.95. 25 ft. double 8mm. 98c. Processing included. Free 16mm., 8mm. lists. Home Movies, Box 216, Easton, Pennsylvania.

**LATE** Talkie programs rented. \$15.00 week; \$7.50 two nights. Simpson, 1275 South Broadway, Dayton, Ohio.

**SAVE** Cash. Catalogue. Bulk film. Penn-Craft, Box 423-M10, Williamsport, Penna.

**BARGAINS!** 8mm., 16mm., free literature. Elder, P-739, Boylston, Boston, Mass.

**ROYAL** Home movies—8mm., 16mm. Cartoons, comedies, westerns, travelogs. Free list. Royal Home Movies, 42H Melrose St., Boston, Mass.

**FOR** Sale—16mm. silent features \$35, single reels \$5.00. Rent for 75c per reel. Waldo Films, Box 524, Cincinnati, Ohio.

**BARGAINS!** Silent 35mm. films. Projectors. Demsey, 1223 Berkley, Youngstown, Ohio.

**16MM., 35MM.** Bargain projector film lists 3c each. Camera film 16mm., 100 feet \$2.20. Clifford Hoffman, 57 Broad, Albany, New York.

**TITLES** From Hollywood. 8 and 16 mm. 25 stock backgrounds, up to 8 words, 4 for \$1. Crown Titles, 1150 No. La Brea, Hollywood, Calif.

**COMPLETELY** New 8mm., 16mm. title information now available! Laboratory Service Manual K-6, film strip specimens for 3c stamp. Cine Shop, 1812 Piedmont, Charleston, W. Va.

**8MM.-16MM.** Bargains. Free catalog. Movie Shop, 833 Broadway, Bayonne, N. J.

**FILM.** Art sample, 10c. Others, lists free. Goodwill Company, Jackson, Tenn.

**BARGAINS**—8mm.-16mm. Films, sale and rent. Used and new equipment, projectors, cameras, screens. Free catalog. Abbe Films, 1265 Broadway, New York.

**16MM. VELOTEX.** Perfect outdoor film. 100 ft. rolls \$1.95 including free processing. Sample free. Velotex Laboratories, 600-E, Gary, Indiana.



**8-16MM. FILMS:** Rentals, exchanges. Free catalogue (with sample film 10c). Garden Exchange, 317 West 50th, New York.

**BEADED-SCREENS** Easily made! Beads, covering 4'x5' screen, \$1.00. Finest, \$1.25. Directions included. Sample, dime. Gard. Box 418-E, Madison Square Station, New York.

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**LOOK!** "The World's Greatest of All Passion Plays," 16mm. and 35mm. Silent or sound, rent or purchase. Hemenway Film Co., 37F Church St., Boston, Mass.

**GUARANTEED 8MM.** 24-hour reversal processing. Double 8mm., 45c. Single, 25c. Univex 15c. Eso-B, 3945 Central, Kansas City, Missouri.

**MOVIE Film.** Develop yourself. Univex, Eastman, etc. Chemical samples 15c. Raw film wholesale. Lake Camera Exchange, Gary, Ind.

**HERE'S News from Bass!** Our 64-page Cine Bargaingram is ready! Free for the asking! 8 mm., 16 mm., and 35 mm. silent and sound equipment. Popeye, Betty Boop, and other films. Accessories to gladden the heart of amateur or professional. A few used bargains: Univex 8 camera, F.5.6 lens, each \$5.75. Univex, motor drive, 8 mm. projector, \$12.50. Bell & Howell model 57, 16 mm. projector, 200 watt, and case, \$32.50. New RCA 16 mm. sound on film camera, Newsreel model, \$250.00. Write today. The book will be mailed at once. Bass Camera Company, Dept. A, 179 West Madison St., Chicago, Illinois.

**15% TO 25% Discount** on still or movie cameras. Free circular. Paramount Co., 327 E. 92nd St., New York City.

**JESUS Of Nazareth.** 16mm. sound silent. Screenart, 729 7th Ave., New York City.

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**RADIO Kits**—\$3.95 up. Complete. Single band; all-wave; 5-10 tubes. Save 50%. Radio and parts catalog free. Marce-PP, Kansas City, Mo.

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**PLANS 18 Record-breaking crystal sets,** with "Radiobuilder"—year, 25c. Laboratories, 7100-C East 14th, Oakland, Calif.

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**SEND For free giant money saving radio and phonograph record catalogue.** United Radio Company, 1000-M, Newark, N. J.

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**WRITE Your own music.** Our book "Harmony" teaches how. Only \$1.00 postpaid. Greenleaf School of Music, 3553 Broadway, Chicago.

**DUO-FLEX Reeds** for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

**SAVE Money.** Improve your playing with La Rae clarinet and saxophone reeds. Fine quality French reeds graded. Send postcard for price list to La Rae Reeds, Box 61, Denver, Colorado.

**FIFTY Late phonograph records,** \$2.50. Wurlitzer selective, amplified, 12 record phonographs, very cheap. Davis Sales Co., Syracuse, N. Y.

**PIANO By ear.** Free booklet. Day-V-Way, Woolworth Building, Dearborn, Michigan.

**SONGS.** Song poems, bought, published, best offer. Free information. Metro Music Publishers, 1204 Sutter, San Francisco.

**SONG Poems wanted.** Extraordinary offer. Songwriters, 1234-C Broadway, New York.

**SONGS—Arranged,** revised by arranger "If I Had My Way"; "Carolina Moon"; others. Send for details. Harold Potter, 1619(P) Broadway, New York.

**SONGWRITERS!** Outstanding, convincing opportunity. Hibbler, C-5, 2157 N. Avers, Chicago.

**ORCHESTRATIONS** Popular back numbers, 10—\$1.00. Silverman, 3305 Lawrence, Chicago.

**SONGWRITERS—Splendid proposition.** Newart Song Publications, 1207 Carbon, Syracuse, N. Y.

**SONGWRITERS:** Truth about song-writing opportunities. Rackets exposed. Send 10c for booklet. Allied Music, Inc., Carew Tower, Dept. E3377, Cincinnati, O.

**SONG Poems wanted.** Free examination. Send poems to McNeil, Master of Music, 510-PM So. Alexandria, Los Angeles, Calif.

**SONGWRITERS—Agents,** new sales plan. National Music-D, 532 Sixteenth, Oakland, Calif.

**MUSIC Composed to words.** Rhyming pamphlet on request. Phonograph recording of completed songs. Send poem for consideration. Keenan's Studios, Dept. PM, Box 2140, Bridgeport, Conn.

**SIMPLIFIED Swing courses!** Accordion, saxophone, clarinet, trumpet. Write Swingmaster, 1259-N Bender, East Cleveland, Ohio.

**MUSIC Composed to words.** Wonderful proposition. Bauer Bros., Oshkosh, Wis.

**WRITE Songs.** Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Hoyne Ave., Chicago.

**WANTED! Lyrics,** melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

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**SONG Writers.** Send for publishing agreement. McKinley Music Publishers, 1501 E. 55th St., Chicago.

**ORIGINAL Music** composed to your words. \$5. 200 printed copies \$10. Reginald Belcher, Chatham, New Jersey. 30 years church organist.

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**WANTED—Factory** representatives for complete Turkish bath outfit for home use. Light, streamlined, compact. Retail \$9.95. Write today for our proven sales plan. Perspirator Mfg. Co., First and Utah, Toledo, Ohio.

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**WORLD'S** Largest "direct selling" book match factory offers liberal daily earnings calling on business places. Experience unnecessary—spare, full time. High quality, quick deliveries, low factory prices. Special features, are booming business. Repeats boost profits. Free kit—full instructions. Match Corp. of America, 3433 West 48th Pl., Dept. E-10, Chicago.

**AMAZING** Invention takes off fat like magic. Reduce your waist, hips, etc. Feel pepped up. It's fun. Women go wild about this Tu-Way Massager. Edward Arnold Company, Loganport, Indiana.

**MEN, Women.** Write quick, excellent money-making proposition. Jay-Way, 26 Journal Square, Jersey City, N. J.

**UP To 300%** profit selling new and used clothing from home, auto or store. Everything furnished. Bargain catalog free. Roosevelt Mercantile, 566-AM Roosevelt, Chicago.

**BIG** Money selling guaranteed reconditioned Elgin, Waltham, Hamilton watches, \$3.75 up. No investment. Free catalog. Grossman Jewelry, 4666-X State, Chicago.

**SELL** Food. Everybody needs food. Own profitable neighborhood route. Complete outfit including large assortment full size packages free to reliable persons. No waiting—good earnings at once. Write for free offer. E. J. Mills, 6120 Monmouth, Cincinnati, Ohio.

**SELL** Artistic oil painted personal portraits! Portraiture, 2637 Evergreen, Chicago.

**FREE** Sample—Sensational guaranteed corn, wart, callous remover sells fast, repeats. Large profits. Baume Laboratories, (Ridgewood Station), Brooklyn, New York.

**EX-O-LENE!** Brand new! Guaranteed power-mile increaser! Millions interested! Protected territory! Tremendous profits! Information free! Thermo Exolene, Peoria, Illinois.

**100 MEN** Wanted! Sell guaranteed tires wholesale. Save users to 70%. Big profits. No experience necessary. Auto Tire Co., 4502-A So. Ashland, Chicago.

**\$1 STARTS** You in business selling outstanding line ties, boxed novelties. Over 100% profit. Silk lined ties, \$1.50 dozen, sample 15c. Slyde-On-Ready-Tied ties, \$2.40 dozen, sample 25c. Write today for descriptive wholesale catalog, prices, free sample materials. Philip's Neckwear, 20 West 22nd, Dept. P-2, New York.

**AGENTS** Make big profits on food products, bargain deals. Low wholesale prices. Rush name for trial outfit offer. Ho-Ro-Co, 2810-T Dodier, St. Louis, Mo.

**SELL** Low priced alcushioned shoes to nurses, beauticians, waitresses, housewives. Unusual salesplan. Write: Dauter Shoes, 923 Washington, Dept. 50, St. Louis, Mo.

**FREE** information. Agents, canvassers. New fast selling item. Absolutely nothing like it on market. Burns, Keystone Bldg., Pittsburgh, Penna.

**NEVER** Before offered at any price! A fad that will sweep the country. Every boy with bike will buy. 50% profit. Exclusive franchise. Write at once for particulars. Address P.O. Box 5376, Chicago, Ill.

**PROFIT** With new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Nominal prices. Gibson Laboratory, Chemists, BD-1142 Sunnyside, Chicago.

**500% PROFIT.** Gold and silver colored sign letters. Offices—stores. Large sizes, 1c. Free samples. Modernistic, B-3000 Lincoln Ave., Chicago.

**POLMET** Polishing cloth removes tar-nish from metals without the use of liquid, paste or powder. Agents say it sells like "hot cakes." Retail 25c. Sample free. Gales & Co., Inc., 15 Edinboro St., Boston, Mass.

**SELL** Drugless health aids. Make chemical demonstrations. Wholesalers. Box 3695, Hollywood, California.

**CHRISTMAS** Cards. Absolutely finest assortment. Big profits. Write for samples. Robinson Cards, 500 Orange, Clinton, Mass.

**CHRISTMAS** Card box assortments selling like "wildfire." People who have never sold a thing in their lives are reaping harvests with our "New Champion" 21 folder assortment, including sensational "mystery card"—Biggest sales-puller of all time. Costs 50c—sell for \$1.00. Worth \$2.85. Also seven other bargain assortments, and personal imprinted cards. Write today. Samples on approval. Silver Swan Studios, 320 Fifth Ave., Dept. 74, New York.

**AGENTS**—Amazing new glass cleaner sells fast, repeats. Demonstrations reap big profits. Needed everywhere. Write Universal Utility, Gloversville, N. Y.

**WORLD'S** Fastest money maker. Sell 50c packs of razor blades for 5c. Tharp, 914 Lexington, Cumberland, Md.

**BIG** Money taking orders; shirts, ties, hosiery, underwear, pants, jackets, raincoats, uniforms, etc. Sales equipment free! Experience unnecessary. Nimrod, 4622-AN Lincoln, Chicago.

**CHRISTMAS** Cards. Earn \$2 an hour. Take orders galore from friends. 50 exquisite folders with name at \$1. Free album 32 designs. Fastest selling 21 folder box in America. Costs 50c. Sells \$1. Request samples. Sunshine Art, Dept. E, 154 Nassau, New York City.

**500% PROFIT!** Transfer sign letters for windows, offices, trucks, signs. Colors: gold, silver, red, many combinations. Auto monograms. Easily applied. Neonite, Akron, Ohio.

**AGENTS:** Smash go prices! Santos coffee 12c lb. 4-oz. vanilla 84c. Razor blades 10 for 84c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unnecessary. Carnation Company, P.O. St. Louis, Mo.

**AGENTS**—To mail our literature. Good profits. Home business. Maywood, 1105-1107 Broadway, New York.

**SUCCEED** With your products. Make-sell. Formulas. Accurate analyses. Catalog free. B. Thaxly Company, Washington, D. C.

**ENGRAVED** Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Wintthrop, Mass.

**300% PROFIT** Selling gold leaf letters for store windows; high grade letters 13c each. Free samples. Metallic Co., 438-B North Clark, Chicago.

**BIG** Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for short order decalcomania name plates. "Ralco," 1305 Washington, Boston, Mass.

**REVOLUTIONARY** Window cleaning tool. Good Housekeeping approval. Only ten \$2.25 sales daily to housewives, factories, schools, stores will make you \$350.00 monthly. Carter Products Corp., 900 Front Ave., Cleveland, Ohio.

**AGENTS**—Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

**STARTLING** Invention—Pocket adding machine. Nationally advertised \$2.50. Whirlwind seller. Big profits. Baby Calculator Co., Box 1118, Chicago.

**BIG** Money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 40, Dunellen, New Jersey.

**FREE** Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

**MANUFACTURE** Specialties, hire agents yourself. Big money. Free literature. Gilbert Supply, 1107-P Broadway, New York.

**AGENTS:** Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

**DO** You want agents for your proposition? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

### HIGH-GRADE SALESMEN

**SALESMEN**—Unlimited opportunity for ambitious man with ear, fast selling, good repeat line popular priced tires. High commissions, exceptional earnings. American Tire Co., Cleveland, O.

**OLD** Reliable AAA1 firm offering new product in popular price range, with a very large market in your own neighborhood, wants salesmen on commission. Earn \$8.00 to \$25.00 per day. Write for details. The Edwards Manufacturing Co., Fireaire Division, Cincinnati, Ohio.

**EARN** Money in your spare time, taking orders from banks, insurance and business houses, for filing and mailing envelopes, folders, pockets, etc. Liberal commission. Send for full details. Ames Safety Envelope Co., Somerville, Mass.

**MEN** Wanted—Introduce amazing dress, sport, and work shirts. Low as 3 for \$2.98. Also ties, socks. High quality, exclusive features. Personal shirts free as bonus. Big commissions. Outfit free. Stylewear, Dept. 101, Erie, Penna.

**SELL** Calendars! Pocket fast cash advanced commissions taking orders for new 1940 Advance Calendar line. Wide assortment of dazzling silver and gold embossed color creations with union label. Includes art wall, nudes, cardboard die cut desk, metal and thermometer calendars. Direct-on calendars low as \$3.95 per 100. Free samples. Write quick for color-beauty sample sales kit. Advance Calendar Products, 82 W. Washington St., Dept. AA, Chicago.

**EARN** 65c On every dollar! Sell Christmas twenty-one piece superline, religious or magicard assortments. Three sample boxes \$1.00 postpaid. Personal imprint Christmas folders, wreaths, wrappings, calendars. Illustrated circular service. Popular sellers! Catalog free! Elko, 440 North Wells, Chicago.

**NEW** "12 In 1" advertising calendars, streamlined form, acclaimed by Chicago advertisers. Sample 10c. Simplex Calendar Co., 225 Second Ave., Lombard, Ill.

**SELL** Printing at cut prices. 2,000 business cards \$1.50; 1,000 envelopes or stationery, etc. \$1.75; 25 printed sales books \$1.50; 1,000 process embossed cards \$1.50; 2,000 two-color labels, free holder \$1.50; 2,500 printed handbills \$1.75. One-third comm. Free outfit. Bargain Ptg. Co., 189-F W. Madison, Chicago.

**SELL** Business stationery \$2.65 thousand, business cards, book matches, advertising gummed tape, restaurant necessities, sales-books, office supplies, pricing sets, advertising specialties, 40% comm. Free premium deals. Sales portfolio free. David Lionel Press, 312 So. Hamilton, Dept. LV, Chicago.

**ESTABLISHED** Company in automatic protective specialties offers unusual opportunity to salesmen. Low price. Generous commissions. Prospects unlimited. Write for details. Firex Corporation, 510 South Broadway, St. Louis, Missouri.

**BIG** Commissions—selling to stores celluloid pricing tickets, metal shelf moulding. To restaurants, menu covers, signs. P. Pricing Press, 124 White St., New York.

**CASH** Profits daily—Agents wanted all cities, sell to stores, new collapsible Neonite flasher sign, cost \$1, sells \$3. Renneker Company, 345 West Hubbard Street, Chicago.

**SELL** America's largest printing line and business necessities. Book matches, gummed labels, political items, salesbooks, office supplies, advertising specialties, business stimulants, beautiful line calendars, Christmas greetings. Hundreds fast sellers. New low prices. Commissions advanced. Experience unnecessary. Samples free. Northwestern, BB-625 Jackson, Chicago.

**TIES**—Wonderful proposition. Free swatches. Eureka, 307 West 38th, Manhattan.



**YOUR Own suits and other gifts free as bonus, plus big cash profits for selling your friends fine quality, individually made to measure suits and overcoats.** Popular new low price ranges help make sales easy. Exclusive sport and swing styles no extra charge. Elaborate selection new fall and winter materials and patterns. Satisfaction or money back guaranteed by reliable thirty year old tailoring firm. No experience needed. Sample outfit free. Jay Rose & Co., Dept. P-109, 330 South Wells, Chicago, Ill.

**ADVERTISING Book matches offer liberal earnings—full, spare time.** Experience unnecessary. Factory direct. Low prices for fine quality, quick deliveries, help get orders; faster repeats. All business firms prospects. Free outfit, instructions. American Match & Printing Co., Dept. 610, 4822 South Trumbull Ave., Chicago.

**SELL America's finest printing and 1940 calendar line.** Big commissions advanced plus extra cash bonus. Every business prospect. Experience unnecessary. Outfits free. Modern Franklin Co., (Est. 1896), 534-B So. Wells, Chicago.

**DON'T Be a job hunter—Start your own business on our capital.** No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. Sales way up this year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world-wide industry. Write Rawleigh's, Dept. J-U-PPM, Freeport, Ill.

**SELL Gas-Miser.** Improves automobile operation. Saves up to 25% gasoline. New scientific principle. Write Dept. PM, Malone & Moles, Sioux City, Iowa.

**SALESMEN:** Sell calendars. Complete line all sizes, including jumbos; beautiful subjects. Samples free! Fleming Calendar Co., 6539 Cottage Grove, Chicago.

**OPENINGS!** Call on all dealers with new trade-stimulator plans. It's "hot." \$3 commission on each \$5 sale. Big repeat commissions. No investment. Sales kit free. Universal, 6227 Broadway, Dept. C510, Chicago.

**CALL On friends with sensational new personal Christmas cards and stationery.** Names imprinted. Also big-value 21 card assortment at \$1.00. Profit 50c. Experience unnecessary. Samples free. Wallace Brown, 325 Fifth Ave., Dept. G-34, New York.

**ANTI-FREEZE For automobiles.** Only "one-fill-a-year" necessary. Nonevaporating, safe. Sells at ordinary alcohol prices to oil stations, garages, car owners, etc. We deliver and collect. Season now open. Trial sample, order books, etc. 25c. Write or wire. By-Products, 1760-D Lunt, Chicago.

**ADVERTISING Book matches—calendars.** Lowest prices. Big cash commissions. Full or part time. New outfit free. Gem Match, 72-PM West Washington, Chicago.

**SELL The Driving Master.** Shows miles per gallon when driving. Analyzes motor. An efficiency driving criterion. Exclusive sales agency available. Driving Master Company, Sioux City, Iowa.

**SELL Mexican novelties.** Commission. Free samples. Marquez. Apartado 1176, Mexico City.

**BLADES.** Finest quality. Factory prices, postpaid. Ace Blades, Buffalo, N. Y.

**NEW Specialty—Sells every business and professional man.** Four \$15 sales daily pay \$280 weekly. Farrell cleared over \$1,000.00 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

**EXCELLENT Opportunity selling our complete line of brushes, largest commissions.** Write for sales plan. Wire Grip Sanitary Brush Company, 2300 5th Ave., New York.

**\$3,000 PROFIT In six months by Foster.** Over \$6,000 in one year by Felton. Over \$30.00 daily profits for 90 days. All selling our special tool set to garages. Exclusive territory. Mesco, Beaver City, Neb.

#### PLAYS, STORIES, MANUSCRIPTS

**WELTON Tinney.** Winnsboro, Texas, will rewrite and type your story for marketing.

**ORIGINAL Poems.** songs wanted for publication, radio. Westmore Music Corporation, Dept. 33G, Portland, Ore.

**RADIO-PLAYS And songs** wanted for broadcasting. Forest Productions, 6513 Hollywood Blvd., Hollywood.

#### EDUCATIONAL AND INSTRUCTION

**CASH In your sense of humor.** Learn gag writing. New uncrowded profession. Tremendous demand. Famous gag builder course less than ten cents weekly. Stamp brings information. Don Ullsh Studios, 443 Wrightwood, Chicago.

**FOR An extremely profitable lifetime business.** operate a collection-credit agency. Free folder. Cole Associates, Syracuse, N. Y.

**REAL Estate taught by 12 actual leaders.** Home study course. Start own office. Earn real money. Morrison School Real Estate, 106 No. La Salle St., Desk 9, Chicago.

**WATCH Repairing** is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script engraving course included. Write for free details today! Nelson Co., K-2001 Manhattan Building, Chicago.

**YOUR Place in life—22 experts** analyze vocations insuring success, security, independence. 128 pages. Over 500 references. Send 25c coin. TrailBlazers Company, Champaign, Illinois.

**POST Office clerk, carrier, railway postal, rural carrier, postmaster, and 50 others.** Apply now for next examinations. Pergande Publishers, Milwaukee.

**INDEPENDENCE** Offered inventive minded. Explanation for stamp. A. Higbee, Canfield, Calif.

**MANY Good jobs open.** Thousands of adjusters paid generous salaries by insurance companies, corporations, etc., to investigate accidents, outwit fraudulent claimants. Free particulars. Burns School, Keystone Bldg., Pittsburgh, Penna.

**GOOD Personality insures your success.** Send for details. Park, 25 Union Park, Boston, Mass.

**DRAFTSMEN** In great demand now. Qualify at home. Particulars free. Monroe Institute, PM-10, Alton, Illinois.

**HOW To secure a gov't job in the classified civil service.** Railway postal clerk, \$1900 a year. Postal clerk, city mail carrier, \$1700. Other jobs, \$1260 to \$2100. Our method helps you pass exams. Men, women, age 18 to 50. Send for free book. Patterson School, 9C Mercantile Bldg., Rochester, N. Y.

**U. S. Government jobs.** \$105-\$175. Prepare now for next examinations. List positions and full particulars free. Write today. Franklin Institute, Dept. R3, Rochester, N. Y.

**AIR Conditioning, arc welding.** Taught by mail. Expert instruction. Special low tuition for those enrolling soon. Universal School Air Conditioning, Manhattan Building, Milwaukee, Wis.

**COMPLETE Instructive treatise on photography,** price one dollar. The Syndicate, Box 578, New Haven, Conn.

**ENROLL Now,** decorating, paperhanging, graining, marbling, sign and pictorial painting. Catalogue free. Chicago Painting School, 102 W. Lake Street, Chicago.

**WRITE For newspapers—gain pleasure, good pay and perhaps fame.** Full time or freelancing (part time). Hundreds of stories, articles, ideas, are needed in every issue. We successfully coach you by mail. 45 years newspaper experience—plenty of contacts for placing graduates. The Millers, Dept. 10, Carmel, California.

**MASSAGE.** Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

**LEARN Auto mechanics, body, repairing, welding electricity, refrigeration.** Diesel. Stevenson's, 2008A Main, Kansas City, Mo.

**TELEGRAPHY Taught thoroughly.** Railroad retirement act creating opportunities for new operators. Expenses low. Catalog free. Dodge's Institute, Hiatt Ave., Valparaiso, Ind.

**SECRET Investigation.** Experience unnecessary. Detective particulars free. George Wagner, M-2640 Broadway, N. Y.

**EVERYMAN'S Legal Manual.** Authoritative advice. \$1.00. Popular Mechanics, 200 E. Ontario St., Chicago.

#### CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

**HAVE Your own money making business.** Learn show card writing, sign painting. Write for details. Begley Specialty, 1472K Broadway, New York.

**BIG Heavy foreign art magazines.** Very popular, hard to obtain. Illustrated: figure paintings, etc., beautiful colors suitable framing. Special import price—three 75c copies (different), \$2.00 prepaid. Art Headquarters, Doty Street, Madison, Wis.

**DRAW Cartoons new, easy way.** No experience. Our clever device does the trick. 25c. E. Cullen, Stepmey Depot, Conn.

**ART Magazine** including directory art books—free. Send 10c postage. Art Headquarters, Doty Street, Madison, Wisconsin.

**PEN And ink drawings.** Let us draw your advertising and catalogue illustrations, from photos, copies or objects. Best work and fair prices. Heraldic Studios, 1914P Oakdale Avenue, Chicago, Ill.

**AMATEUR Cartoonists** wishing steady income copying and duplicating cartoons for advertisers, write Ad-Service, Argyle, Wisconsin.

**FIGURE Studies from France.** Book contains hundreds by master of form, roundness. Collection formerly \$5.00. Now bound, large size. Only \$1.00 prepaid, while they last. Art Headquarters, Doty Street, Madison, Wisconsin.

#### ADVERTISING AGENCIES, LETTER WRITERS, FOR ADVERTISERS

**PROFITABLE Sales campaigns, letters, advertisements, courses.** Reasonable. Underhill, Beebe, Arkansas.

**MAIL Sales promotion.** Samples and suggestions without obligation. Fryer & Hall, 4639 Chestnut Street, Philadelphia.

**FOUR-LINE Ad.** 185 newspapers, \$5.28. Lists free. Fidelity Advertisers, W-3838 Washington, Chicago.

**INCH Display.** 28 magazines, \$1.50. Paramount Press, Atlanta, Missouri.

**ADVERTISE: 24 Words in 250 newspapers \$10.** Lists free. Advertising Bureau, 4515-C Cottage Grove, Chicago.

**INCH Display advertisement 30 magazines year \$24.** Wood's Popular Services, Atlantic City, N. J.

**LEARN Advertising quickly at home.** Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 343C, Chicago.

**SELL Your product through agents, mail order.** Advertise newspapers, magazines. Publishers' rates. Snappy layout your inch advertisement \$1. Martin Advertising Agency, 171M Madison Avenue, New York.

**DIRECT-MAIL Advertising services.** Sales letters that sell. Mailing lists. Omaha List & Letter Co., Box 2172, South Omaha, Neb.

**ADVERTISING Placed all magazines, newspapers, radio.** Lowest rates. Free service. 54 page rate book free. Baker Advertising Agency, A-189 West Madison, Chicago. Successors to Ankrum. Established 28 years.

**FREE—New Advertisers Rate Guide, 44 pages.** Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

**BEFORE You advertise—Get our Ad-Guide of newspaper, magazine rates—full of priceless pointers for advertisers.** 3c stamp. Chicago Advertising Agency, (Established 1900), 29-PL West Jackson, Chicago.

**33 WORDS 25 Magazines \$2.00.** Goodall Agency, 628 Montgomery, San Francisco.

#### BUSINESS SERVICE

**JACKSONVILLE, Florida,** mailing address. BMA Co., 5027 Sunderland Road. \$3.00 month.

**PERSONAL And business mail received and forwarded.** \$2.00 monthly. Dunn Mail System, Box 42, 216 West 60th St., New York, N. Y.

**CHICAGO Mail address.** Phone service. Daily forwarding. Secretarial service. Hancock Company, 43 East Ohio, Chicago.

**WHERE To buy anything! Wholesalers, manufacturers.** 25c (coin). Jeans Buyers Service, Box 440, Jamestown, N. Y.

**SAN FRANCISCO Address: \$1.00 month.** Mail forwarded daily. Morris Service, 905 DeYoung Building.

**LET Us merchandise your household ideas.** Hoffman Lion Mills Co., Inc., Fall River, Mass.



### RUBBER STAMPS AND OFFICE SUPPLIES

RUBBER Stamps made to order. Federich Tool Co., Bx10A, East McKeesport, Penna.

2 LINES 25c, 3 Lines 35c. Stamp Works, Auburn, Neb.

BETTER Rubber stamps 3 lines 35c. Augustin Stamp. Pond du Lac, Wis.

2 LINES 25c, 3—35c. Cushioned. Stamp Works, Centerport, N. Y.

ORIGINAL. Cushion mounted. One, two lines, 25c; three 35c; four 45c. Stamp Works, 814 Bradley, Peoria, Ill.

### TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

NEW Typewriters and adding machines 25% off listed prices. Guaranteed. Money saving bulletin free. Richmond Service, 504 Broadway, Sterling, Ill.

MIMEOGRAPH and duplicator supplies, stencils, etc. Approximately half price. Mishak, Waseca, Minnesota.

INCREASE Business now. "Excellograph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

NEW \$3.75 Automatic adding machine. Fully guaranteed. Bassett, Box 592-K, Alhambra, California.

TYPEWRITERS. Adder, mimeograph, multigraph, addressograph. Send for free lists of machines that will help you at half price. Pruitt, 28 Pruitt Bldg., Chicago.

### PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

LETTERHEADS. Envelopes, 125 each \$1.00 postpaid. Smith Printery, Hollendale, Wisconsin.

PRINT Anything. Lowest prices. Samples free. Hamilton Press, 4341-P Meade, Chicago.

3000 BUSINESS Cards \$1.50. 1000 envelopes, noteheads, statements, billheads \$1.75. Elmer Griffith, Sciotoville, Ohio.

STATIONERY. Folders, circulars, postcards, labels—all printing. Lowest prices. Samples. Goodprint, Harrisonburg, Va.

LETTERHEADS. Envelopes, statements, 6x9 circulars, 1,000, \$2.95. Underhill, Beebe, Arkansas.

PRINTING—\$1.00 Up. Christmas cards 25c. Universal's, 203 Avon Avenue, Newark, N. J.

BETTER Grade printing, free trade illustrations. Reasonable. Economic Press, Leonia, N. J.

500 LETTERS Multigraphed exactly as if typewritten, \$1.70 (20 lines.) Multigraphers, Ashland, Virginia.

FONT Of condensed Gothic type and bargain list 25c. Republic, 7150 Cottage Grove, Chicago.

BETTER Printing for less. Samples free. Holman's Printery, Downsville, Louisiana.

2000 BUSINESS Cards \$1.50. Zwickel, Dept. AA, General P.O. Box 60, Brooklyn, N. Y.

1000 WATERMARKED Bond letterheads \$3.25. Evers' Print Shop, Altmore, Ala.

EXPERT Typewritten reproductions, letters, price lists, etc. 100 copies 8 1/2 x 11—\$1.00. Additional hundreds 20c. Includes paper! Letter-Shop, Dept. P, Cedar Rapids, Iowa.

\$1.00 POSTPAID. 125 8 1/2 x 11 Twenty pound bond letterheads and 125 envelopes. Benneville, 907 West Roosevelt, Philadelphia.

LETTERHEADS. Statements, envelopes, 5000 \$5.95, 6x9 circular \$4.95 (estimates). Alpine Press, 325 East 88th, New York.

1000 STICKERS. Four lines. 50c. Labels. Catalog. Cott's, Spickard, Missouri.

QUALITY Printing reasonable. State your requirements. Acorn Printing, Montclair, New Jersey.

500 BOND Letterheads, 5 1/2 x 8 1/2, \$1.25 postpaid. Wehner, 25 Fulda, Roxbury, Mass.

1000 BUSINESS Cards \$1.00 post paid. Superba Print, 912 Towne, Los Angeles, Calif.

BOOK Matches—Printed your name, address—100, \$1.00; 32, 50c. Sanderson Match Co., Ottawa, Illinois.

1,000 2 1/2 x 4 LABELS \$1.65; 2x4, \$1.50. Paramount Press, Atlanta, Missouri.

10,000 CIRCULARS 3x6, \$4.50, 10,000—6x9, \$7.50. Printing ad on back. Lackawanna Printing, Lackawanna, N. Y.

2000 BUSINESS Cards \$1.50. General printing and estimates cheerfully given. Florence Printing, 270 Lafayette St., Manhattan.

GET Acquainted. 250 letterheads, 8 1/2 x 11, or envelopes 60c postpaid. Express Newspaper Publishers, Express Building, Atlanta, Mo.

250 8 1/2 x 11 BOND Letterheads, 250 6 1/4 x 24 envelopes, \$2.00. No trash. Work guaranteed. Kunz Advertising Service, 407 Cedar, Scranton, Penna.

ILLUSTRATE Freely without cuts. Write for details and prices on photo-offset printing. Roberts Service, 250 W. 49th St., New York.

\$2.25—1000: LETTERHEADS, Envelopes, statements, circulars. Samples. Midwest Printing, Minneapolis.

HAMMERMILL Letterheads, any color paper and ink, 300 8 1/2 x 11, \$1.48 postpaid. 39 type styles available. Free particulars. Woodruff's, 217A Lewis, Duluth, Minn.

500 3 1/2 x 2 1/4 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

### PRINTING OUTFITS AND SUPPLIES

PRESSES. Type, cabinets, supplies. Catalogue for stamp. Lincoln Press, A-22 Hartwell, Fall River, Mass.

USED Presses, type, supplies. Lists 3c. Turnbaugh Service, Loysville, Penna.

NEW Type 29c font, catalog dime. Box 123A, Jackson, Michigan.

PRESSES \$4.00. Shaded card type 40c. Send stamp. Bradshaw, 3214-P Huron, Chicago.

PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfits \$9.00, senior outfits \$17.00 up. Details free. Kelsey Presses, D-11, Meriden, Conn.

BARGAINS For printers. Catalogue 10c refunded. Smith, 80 William St., Nutley, N. J.

SCREEN Process instruction. Write. Artsets Company, 21 Kentucky Avenue, Indianapolis, Ind.

BARGAINS — Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

LONG Established printers warehouse. Big lists 3c. Landis, Richland, Penna.

HAND Presses, type and complete printers' supplies. Send stamp for catalog and new price list. P. Peiffer & Co., Newark, N. J.

BARGAINS, Presses, type. List 3c. Exchange, E-15, 110 Dexter, Meriden, Conn.

### PATENT ATTORNEYS

INVENTORS: Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how Patent Laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Forty-one years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 113-L Victor Building, Washington, D. C.

INVENTORS: Before filing investigate my plan. Save 20 to 35 percent, all patent service. Grover C. Hill, Registered Patent Attorney, United States and foreign patents, 966 National Press Bldg., Washington, D. C. Dept. A.

INVENTORS—Before disclosing your invention to anyone send for form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 411 Bowen Building, Washington, D. C.

PATENT Your invention! Send today for my new free book containing facts necessary for the protection of your invention. A frank discussion on patents, patent searches and vital information written especially for your benefit. Write me personally. Hugh E. McMorro, Registered Patent Attorney, Dept. 323-B, Barrister Building, Washington, D. C.

INVENTORS—Time counts—Don't risk delay in patenting your invention. Write for new 48-page free booklet, "Patent Guide for the Inventor." No charge for preliminary information. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 58-Y Adams Building, Washington, D. C.

PATENTS—Trade marks. Preliminary advice, book and disclosure form free. Personal service. Irving L. McCathran, 1060 International Bldg., Washington, D. C. Registered Patent Attorney.

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"INVENTOR'S Guide." 100 mechanical movements, free; advises on patenting, selling inventions. Frank Ledermann, Tribune Bldg., New York.

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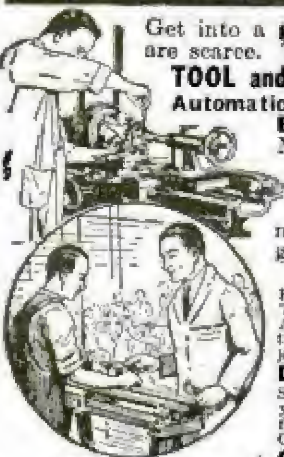
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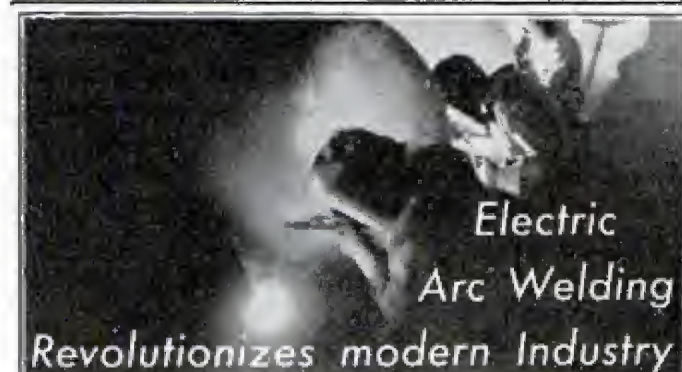
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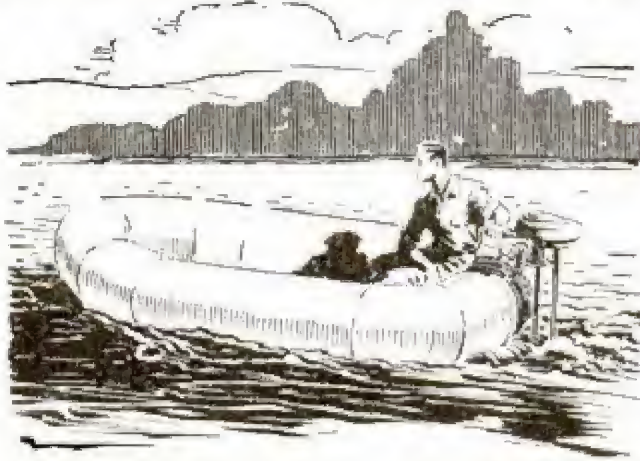
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# POPULAR INVENTIONS

(Continued from page 34A)

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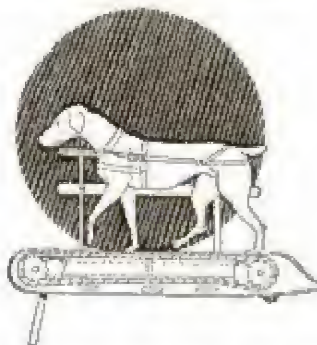
a substantial area of an inflated tube portion of a fabric boat, with an extension rising from it to hold the motor.

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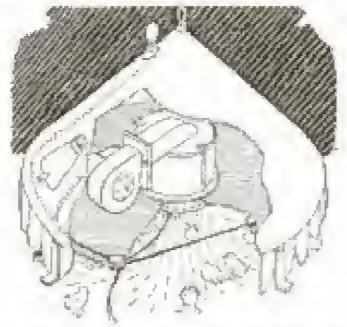


the periscope's lens at the lower end. Then, by snapping the shutter by an extension control, he takes the picture over the heads of the crowd.

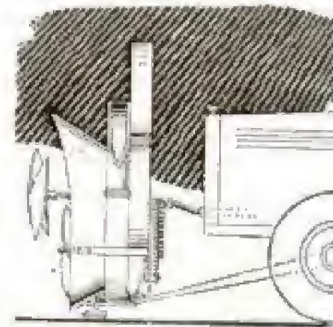
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**M**ANY chicks may be saved through use of an electrically heated brooder that keeps the temperature at the point desired and makes for an increase in the health factor. The brooder has a blower and a heater. Passages provide for discharge of air from the blower to the heater housing and thence to the brooder space, through outlet holes at the lower edge of the heater housing.



**A**NY heavy vehicle, such as a truck or a bus, could be converted for snowplow use by attachment of a recently patented plow. It has three blowers, ahead of which are mounted augers for boring into the snow. The blowers force the snow away from the front of the plow after it has been loosened. The plow may be attached to the front of the vehicle.



**G**REATER speed in swimming is the objective of a hand plate patented recently. It consists of a curved concave plate attached to the swimmer's wrist and held by inserting the fingers into loops on the back. The plate, being much larger than the hand, gives an increased surface for propulsion as the swimmer makes the normal strokes.



Ⓒ Due to the fact that many of the devices described in this department are still in the patent office stage and are not on the market, Popular Mechanics Magazine cannot undertake to supply further information regarding them.



# A Sensational New Business

## *That May*

# *Sweep You to Riches*

This is undoubtedly the most amazing money-making opportunity ever offered to the readers of this—or any other—magazine. It tells how any ambitious, level-headed man can quickly establish a remarkable new kind of business that may pay a steady net cash profit of \$40.00 a day—a business that offers unlimited opportunity, rapid expansion—a business in which you can employ others to work for you and run your daily profits up as high as you want them to go—a business that may make many men independently wealthy within the next few years.

**H**ERE, briefly, are the "high-spots" of this thrilling new business that should create "fortunes" for those with the vision and foresight to get in on the ground floor now:

**1** An utterly new product with a natural, staple demand and big repeat business, yet one that has all of the appeal of a novelty.

**2** Requires no house-to-house canvassing or selling. You simply manufacture. Every store, tavern, club, or any establishment where any sort of food is handled are your immediate customers.

**3** Starting with one unit alone you have a capacity to enable you to make \$42.00 profit a day selling at wholesale.

**4** An amazing product that can be manufactured by special secret process by only one mill in the country. This mill, one of the largest of its kind, manufactures the product exclusively for us and our operators. No one else can make it or buy it. This means your protection from cut-throat price competition.

**5** All year around business; no slack seasons.

**6** Tremendous natural demand in every community, whether large or small.

**7** Absolutely no experience needed to be successful.

**8** No expensive equipment needed. Your whole investment will be less than your first week's potential income.

This is truth; not fiction—fact; not theory. To the best of our knowledge, no other business in America offers one-tenth the opportunity for profit and independence.

### *Vision Turned to Reality*

A short time ago, this amazing money-making product was nothing more than a dream—today it is a reality.

It is a practical, tried out, thoroughly tested business!

Every detail has been perfected—complete and tested plans of operation worked out—all necessary equipment ready to turn over to those who are prepared to develop this new "gold mine."

### *No Selling—No Canvassing*

Do not confuse this new product with anything you have ever heard of before. It is not a potato chip, not candy, not a cheese chip, not a paste preparation—but a natural product that comes from the sky, from the ground, and from the air. It is not like anything you ever saw or heard of, or imagined. The simple truth about it is stranger than your wildest dream. And you can be the first to supply this great demand.

### *\$100.00 a Week, Net, to Start*

According to accurate figures, the very minimum of the first operation should produce a net cash profit of at least \$100.00 a week. Since it is possible to make \$42.00 a day, you can see that it would take only two and a half days of full operation to make a profit of \$100.00. This, we figure to be a minimum. We would not be interested in appointing men who could not make at least that much every week. Then, as demand increases, other men can be put to work for you and you can double, triple or quadruple your weekly profit as steady repeat business develops.

### *No Expensive Equipment*

Ordinarily a proposition as big as this would require the purchase of expensive equipment with which to manufacture this remarkable new product. But in this case our manufacturing process has been so simplified that we can furnish you with everything you need to start off making a profit the very first day—all for an investment of \$150.00.

### *No Experience Needed*

Absolutely no experience is required to quickly become successful in this thrilling and fascinating new business. We tell you how to start—how to establish yourself quickly—how to operate the business the very day you are ready to go. We furnish all necessary plans, systems and equip-

ment. Any man with ordinary intelligence and a real desire to succeed is bound to make money.

### *Small Town or Big City*

Another feature that makes this business unlike any other is that it can be operated anywhere. No matter where you live—in the smallest town or the largest city—you can establish yourself practically over night and start enjoying an independent income at once. From the foregoing facts, you can readily see that this is not a business for the timid operator who is satisfied to make a bare living, but for the wide-awake, aggressive go-getter who wants to see his energy and enthusiasm produce the greatest possible results in the shortest possible time.

### *Facts Sent Free*

To all such men, we request permission to mail an unusual and complete presentation. After you have read the amazing facts and figures in this presentation, then you can decide whether or not an initial investment of \$150.00 is too much to ask for a complete business that can bring back that investment in the first three days of operation, and then continue to pay as much as \$252.00 a week net profit for one man operation, and up to as high as a thousand a week net profit to those men who have the ability to organize and direct other men.

### *Act Quickly*

There is no time to lose. Today this proposition is new. Tomorrow it will be a little older—next week a little older still. So get the facts without a moment's delay. It's the newcomers in any enterprise of this sort—the "ground floor operators"—who always reap the richest rewards.

There is no coupon on this ad. We do not want to hear from coupon clippers. If you don't agree that this is worth a letter—or a telegram—you are not the man for the business.

So write or wire today—without the slightest cost or obligation—and get the information that can make you independent for life.

**KING K. CO. Dept. K-310**  
**620 N. Michigan Ave.**  
**CHICAGO ILLINOIS**







**NEWEST** workshop lighting idea is the G-E MAZDA Reflector Lamp. A bulb and spotlight in one, it's ideal for extra light on jigsaw or drill press.



**G-E MAZDA Reflector lamp** (left). Spotlight throws intense downbeam on fussy jobs, yet silvered sides protect the eyes, 150 watt, 95 cents.

**EVERY YEAR** G-E research and development makes G-E MAZDA lamps give more light for current consumed.

**THEY STAY BRIGHTER LONGER IF THEY'RE MARKED**  



## HOW TO LIGHT YOUR HOME WORKSHOP

**O**F all the tools a man can have in his workshop, good light is perhaps the most important. You can't work well or fast without it! The question is, what is good light? Standard for workshop lighting is still the RLM dome reflector, like the two shown above, with 150 watt inside frosted G-E MAZDA lamps. Something new and different, is the new G-E MAZDA Reflector Lamp. A MAZDA lamp and reflector in one, it's perfect for downlight on difficult jobs. Whatever type you use, it pays to get G-E MAZDA lamps. They give more light for the money because they *stay brighter longer!*

## G-E MAZDA LAMPS GENERAL ELECTRIC

**Send for FREE Light Conditioning Wheel!**



General Electric Co., Dept. PM-J,  
Nela Park, Cleveland, Ohio.

Please send me free your interesting new "Light Conditioning Wheel" that shows how to get better light in any lamp or fixture.

Name.....

Address.....

City.....State.....



# Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 72

OCTOBER, 1939

No. 4

## FORTY FATHOMS DOWN *with the* DIVING NAVY

By Nat A. Barrows

### PART I

IT IS a tense moment on the crowded fantail of the navy's diving ship "Falcon." Far below, at the terrific pressure depths where the wrecked submarine "Squalus" lies partly buried in "blue mud," something has gone wrong with a diver. For nearly half a minute no "okay" signal has come from Bill Badders, no word since his distorted voice, shrill and unnatural from the effects of compressed air, blared out of the telephone loud speaker: "Hold everything, I'm in trouble!"

A sailor pushes his mouth close



Above, Martin Sibitzky, first to reach the sunken "Squalus" and attach cables of rescue chamber, swings over "Falcon's" rail for another trip down. Left, after seven weeks on bottom the submarine suddenly breaks the surface, tears away from its pontoons and then sinks again

105 Isrover Ave. Waltham, Mass. 481





*Top, swirling water marks spot where pontoons lifting submarine are nearing surface. Center, the "Squalus" on test run off Portsmouth. Below, navy men inspect pontoons after failure of first effort to raise wreck*

to the two-way loud speaker, repeating in even tones: "Hello, Bill, are you okay? . . . are you okay?" There is no answer. The magical loud speaker, in use for the first time in salvage history, gives back only the rumble of the compressed air roaring down Badders' air line. All hands peer at the telephone panel with grim faces, imagina-

tions running wild with the fearful things that can happen to a diver in trouble where the 109 pounds of pressure per square inch is enough to squeeze him into pulp.

Seconds pass. No word from the bottom. The telephone tender repeats monotonously: "Are you okay?"

The "Falcon's" diving officer, Commander Charles B. Momsen, dares not wait any longer.

"All right, 'Skee,' get

down there," he says, addressing a blond giant in the grotesque dress of the deep sea diver. "You know what to do."

Martin Sibitzky crumples a cigarette awkwardly in his great mittens. He nods and his face is grim. "Skee" Sibitzky knows well enough what to do. Ten days ago he walked the watery deck of that submarine when thirty-three living men, huddled in the bitter chill and

murk of the forward compartments, responded to his welcome foot sounds with hammer tappings, confident that the submarine rescue chamber would get them out alive. Yes, "Skee" knows the menace of the death that hovers 240 feet below the surface.

Tenders drag him to his feet, help him



shamble to a box. His breastplate already is fastened, his leg braces tightened. Ever since Badders swung over the side in the diving stage and worked his way to the descending line, "Skee" has been ready, the stand-by diver for just such an emergency as this. A dozen attendants lift on the helmet, deftly screw it into place and snap the safety lock, rig the air line and life line under his arms and make fast the 200 pounds of lead weight. They work rapidly but with precision. There can be no mistake—if Sibitzky wants to remain alive on the bottom.

Master Diver J. H. MacDonald takes a final look at the fittings before he gives the signal to the winch operators and taps Sibitzky's "hat" twice to indicate he is ready to go over the side. The tenders help Sibitzky lumber to



*Top, Master Diver William Badders, decorated for heroism on the "S-51" salvage job, takes oxygen while resting in recompression chamber of the "Falcon" after twenty minutes on ocean bottom. Center, outside the recompression tank or "iron doctor." Bottom, preparing one of the huge pontoons used in salvaging the "Squalus"*

his feet, to the center of the steel diving platform lying on the deck. Holding to each side of the inverted V of the platform supports, the diver gives a clumsy nod of the fantastic head gear and the platform begins to rise from the fantail, over the rail.

Momsen watches silently, one ear tuned to the loud speaker. The tender drones on: "Hello, Bill . . . what's the matter?"

Sibitzky and the diving stage clear the rail and swing over the water. Gradually he drops down until only the helmet shows. On deck, the





nineteenth dive—and kept on going. The "Falcon," veteran of the "S-51" and "S-4" jobs, had raced up from New London with the priceless rescue bell. Sibitzky had made that all-important first dive to attach the downhaul cable to the forward hatch. He went forward because there had been no sound aft from the time the "Squalus" crashed to the bottom, poking her flooded after compartments deep into the muddy clay, leaving her bow tilted upward at ten degrees. If he missed the submarine on that first dive, if he fumbled about in the murk, it meant just so much longer before the thirty-three living men inside

stertorous escape of his air exhaust resounds above the slap of the gentle easterly wind rolling toward the New Hampshire shore eight miles away.

The diver remains on the platform, a few feet under water, long enough to get his air control valve adjusted properly for the slide down the descending line, like a fireman on a pole. In another few seconds, he will reach for the heavy rope hawser that runs from the "Falcon's" rail to the deck of the "Squalus," holding the line with his right hand, turning the pressure control valve on his left breast with the other.

"One hand for the government, the other for yourself," he will remember as he starts to sink.

One other day Sibitzky hung like this at the surface of these chilly waters near the Isles of Shoals, an hour's slow run from the Portsmouth navy yard. That was the morning of May 24, the day after the 299-foot "Squalus," one of the largest submarines in the world, went down for her



*Diver at submarine school, top, attempts to enter "sunken" ship under simulated disaster conditions. Center, rescue ship "Falcon" at wreck scene. Below, models demonstrate plan for raising "Squalus"*



the bleak tomb could be brought to the surface in "McCann's elevator." Sibitzky hit the deck within six feet of the desired spot, a feat in any man's diving navy.

Now, with the thirty-three survivors safely back in the sunlight and air, some of them actually aboard the "Falcon" as relief crew members, the towering blond is ready again for the two-minute slide to the bottom—to the aid of a distressed shipmate.

But . . . hold everything! The telephone is speaking.

Badders' voice comes out: "Hello on deck, I'm okay now. I got my lines fouled and I sure was in plenty of trouble."

The voice is full of fatigue, groggy, but there is no sign of excitement or hysteria. The experienced diver, working at such a depth, knows he must keep cool at all costs; otherwise his blood stream, already running wild with an excess of nitrogen, will quickly send him into a coma.

Momsen himself takes over the telephone. The look of fearful anxiety has gone, but he still has a problem.

"Hello, Badders, this is Momsen," says the co-inventor of the Momsen submarine "escape lung" and one of the world's greatest diving authorities. "Want any help? We've got Sibitzky at the descending line now, ready to come down."

"No thanks," Badders replies. "Give me a moment to get this carbon dioxide out of my 'hat' and I'll be okay."

Momsen makes only a simple reply, "okay." From long experience, he realizes that a diver under pressure must struggle even to think. At the crushing pressure of 109 pounds a square inch a diver is so groggy and drowsy after a few minutes on the bottom he is apt to forget why he came down, or to start singing, or to stand blankly, talking to himself.

(Continued to page 134A)

## Buggy Train Helps Nurse Care for Many Children



Many children are taken on an afternoon's outing by nurse who guides a horse-drawn train of baby buggies through the streets

Children at a nursery in Geneva, Switzerland, have gone back to the horse-and-buggy idea to solve the problem of a shortage of nurses. Several perambulators are coupled together, and these, with their passengers, are drawn through the streets by a horse. One nurse takes as many as three dozen children for an afternoon's outing.

## Chains Mounted on Disk Wheels with Simple Spring Tool

For emergency mounting of chains on disk wheels, a spring steel tool enables the user to attach the chains without soiling hands or clothing. The flat spring has a hook to which the chain is attached. Pulling the hook through the slots is easier than attempting to work the chains through without tools.



Putting chains on disk wheel with spring tool

Union Spring & Supply Co.



## Wide-Angle Binoculars Tested for Sports



*At the races, a fan tried out the wide-angle vision binoculars used by the army*

For getting a wide-angle view of the event, a spectator at a recent regatta tried out the type of binoculars used by British army field officers. A sports adaptation of the military instrument is planned, since the binoculars give a greater range of magnified vision than ordinary binoculars.

## Cables Between Lanes of Traffic Are Safer for Car and Driver

There is less danger of damage to automobiles, and less chance of injury to occupants, where cables are used instead of concrete abutments to separate traffic



*Cables between traffic lanes do little damage to cars that hit them, and prevent head-on collisions*

lanes. On Chicago's lake-front drive, cables are stretched between concrete anchorages topped by a red light and spaced ninety feet apart. Being resilient, they yield slightly when hit by a car, yet keep it from crossing into the adjoining lane.

## Paint Stirred by Electric Mixer in Pint Cans or Barrels

Painters may save time by using a power mixer equipped with "wings" that stir the paint thoroughly in any size container from pint cans to barrels, which lock se-



*Paint mixer with power unit raised to top has its stirring blade adjusted for quart-size container*

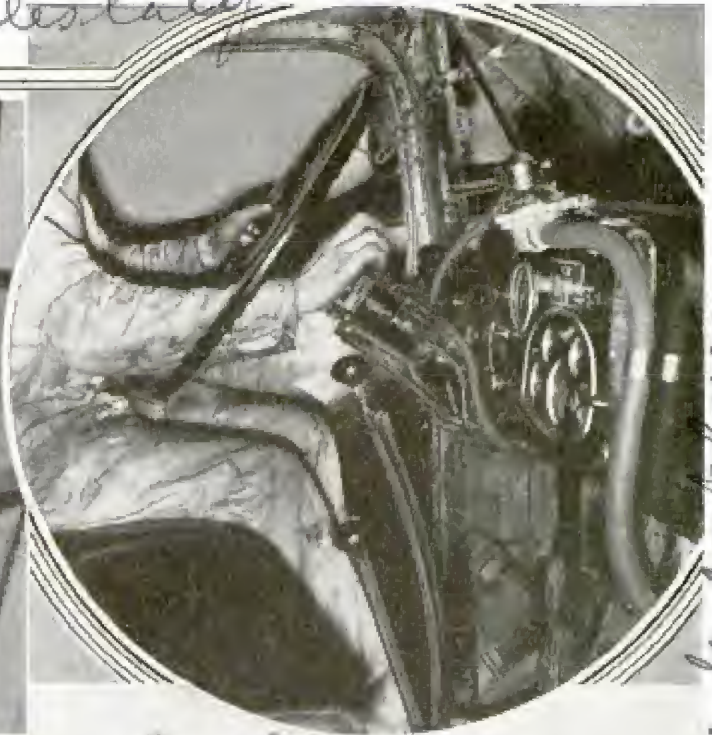
curely to the stand. Rotated at 280 revolutions per minute by a one-third horsepower motor, the agitator blades move up and down to reach all the ingredients regardless of their density. Paint can be mixed in its holder with the cover in place if an opening is made in it for the shaft. Weighing ninety-five pounds, the unit may be moved about on its rubber-tired wheels or fastened permanently on a bench. In addition to performing as a mixer, it is designed to operate a flexible shaft with a chuck for buffers, grinding wheels and other attachments.

*Fred M. Luddings,  
130 Sheffield Ave.*



# No Wreck Is Too Big for Super-Salvage Car

*3915 Broadway Place  
Los Angeles, Calif.*



Goliath of wrecking cars, at right, can hoist 75,000-pound derelict up a cliff. At left, above, six levers behind the driver's seat control dual winches; right, view of the cab



Over an icy embankment in the California mountains skids a twenty-ton truck, to crash down the precipitous side of a ravine 500 feet deep. A call for help goes in to Los Angeles, and swiftly the super-tow car is on its way to the scene. Hoisting twenty tons up the face of a cliff is a terrific salvage job, but this giant that weighs fifteen tons, itself, accepts all challenges. It is tow car, truck crane, fire engine and ambulance, all in one. Its dual winches, each carrying 3,000 feet of cable, can lift 75,000 pounds. At the scene of the wreck, a dynamo in the rear, driven off a two-cylinder motor, begins to whir and 3,000-candlepower floodlights illuminate the salvage work. An electric pump is unloaded, a hose run down the cliff and the truck's gasoline is pumped, for safety, into the 250-gallon tank of the tow car. Then heavy drag lines are attached to the wreck, anchors are dropped to brace the tow car,

fire extinguishers are made ready for emergency, and the motors roar. Behind the driver's seat the six control levers are manipulated and the winches take hold, slowly hoisting the truck to the highway. There it is loaded on a dolly whose dual pneumatic air brakes are attached to the brake system of the tow car; if necessary, an additional braking system can be installed connecting the vacuum or air brakes of the wrecked car to the tow car's brakes. Thus, if quick stops are necessary, the driver of the salvage unit can actually apply the brakes of the car he is towing. There is even a portable kitchen aboard the car to prepare food for the crew on long salvage jobs.

☐ Fresh-water fish are being converted into sea-food products for the table by a Hungarian process of treating them with chemical salts.

*American Chemical Society report.  
See news column 7.19.39*

*made in shop of operator by employees.*



2662.

Mr. J. C. Webb, Apr. 5  
Buckingham Apts.  
4822 Second Road, Wash

# The WAR HORSE

Arlington, Va.



*Unless he has been through cavalry college, any horse will naturally shy at a saber waved over his head or the blast of a pistol close to his ear*

But your cavalryman can fire a pistol inches from his face, jump him over fences and ditches, ride him down a precipitous slope. He can march him steadily past a brass band, make him swim deep rivers. He can cause him to stand steady under artillery fire, even gallop into the very jaws of death. And with no reward but a mouthful of hay or oats, that he could earn peacefully anyway pulling a milk wagon.

Horses don't learn to be brave. There is no room in their brains for ideals. But they can be taught that the noise and confusion of battle are a part of life. They learn so gently and gradually that cavalry horses are the most tractable animals in the world.

For the army has a system.

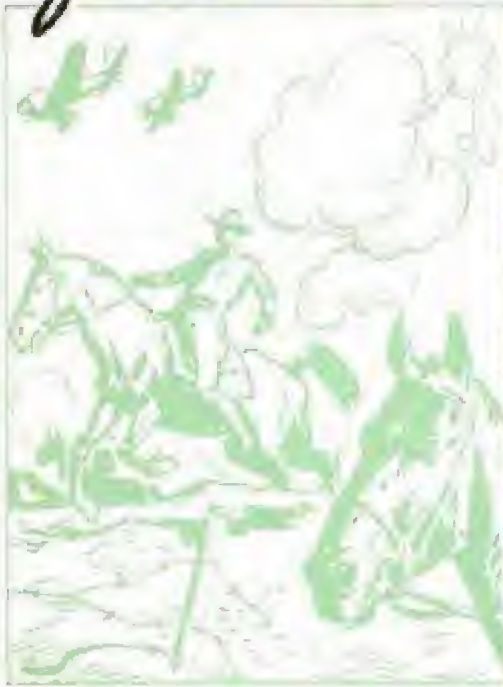
The system begins at birth for most cavalry horses. Bred of selected stock at remount depots, they are handled and groomed from the time they are tiny colts. They are gentled. They become accustomed to men, who pet them, lead them, feed them. When turned over to troops they require no breaking as the term is

**I**F YOU'VE ever ridden a skittish horse that shies at a scrap of paper blowing across the road and all but unseats you at the sound of a car backfiring, you wonder how the cavalryman rides his mount into the noise and fury of battle.

Those six hundred horses who carried six hundred men to death in the famous "Charge of the Light Brigade" had no sense of patriotism or glory. The horse is, in fact, a timid animal. Untrained, he will shy at his own shadow. He will stop short of a fence or ditch he could easily leap. He will avoid deep water as gingerly as any kitten.



# Goes to COLLEGE



commonly known; only conditioning for strenuous work, and schooling.

The training starts by the riders leading them. And there is a technique for even this simple maneuver. The rider merely grasps the halter rope, turns his back, and walks off. The horse goes along. The inexperienced man would face his mount and



*Before either horse or rider would dare a plunge down such a precipitous slope as that at top, the mount is gradually inured to rough terrain. Below, at left, cavalryman takes jump and then lunges saber at dummy; if the horse shies, he misses. Right, army gas mask for horses*



Sold by Little Joe Palmer, 7 S Howard St., Baltimore, Md.



about \$5.00 retail

pull, and the horse would tend to pull back.

Each succeeding lesson will be a new experience for the horse, and he will tend to fight it. So he must first be exercised to tire him out. For this purpose the cavalry has perfected a sort of bitless bridle called a cavesson. This consists of two well-padded pieces of strap iron, hinged in the middle, curved to fit the horse's face. Normally, it is perfectly comfortable; but a pull on the ring, attached where the pieces are hinged, will draw the two sides together and press on the nerves running down each side of the mount's face. The harder the horse pulls back, the tighter becomes the pressure. To this ring a long web line called a longe is attached. The horse is started running in large circles at the end of the longe, and soon learns it is more comfortable not to fight the cavesson.

Soft from months in the pasture, he tires quickly and is willing to stand, while the rider caresses him, picks up his feet, places blanket and saddle gently on his back. But at any sign of rebellion he is given another trot on the longe. When he submits to the saddle, he is led about with it on his back, to accustom him to the feel of it, to the creak of leather, the rattle of rings and buckles. Then the stirrups are lowered, and in a short time he gets

used to having them swing at his flanks.

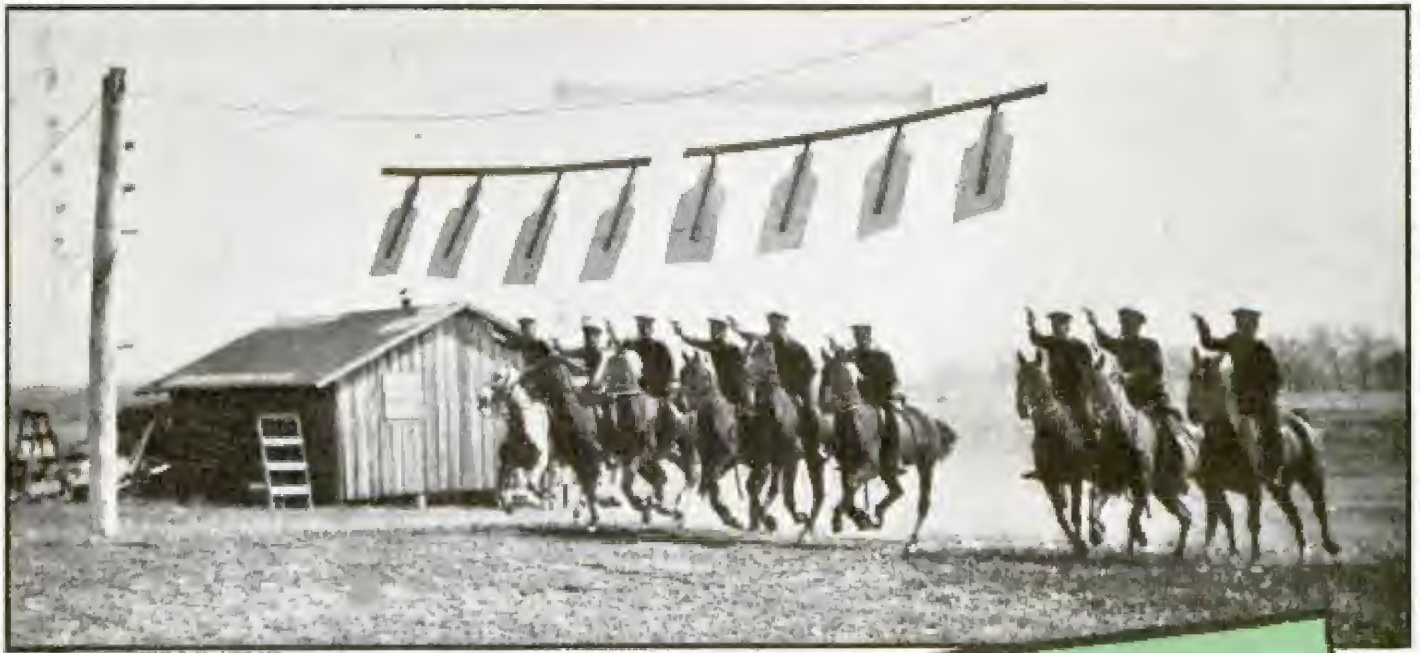
By the second or third day he is ready for mounting. This is done gradually at first, and only after a session with the cavesson and longe. First the rider strokes the horse's neck, places his arm around it, edges back to the saddle. Then he places a hand in the stirrup, leans some of his weight upon it. More leading; then the rider leans an arm across the saddle and hangs there a moment. He places a foot in the stirrup, lets the mount feel his full weight for a while. The horse becomes accustomed to this, ceases to sidle away; and on one of those sallies at the stirrup, the rider finally swings into the saddle.

It is seldom that a horse, well exercised then mounted so gently, bucks. If he does, he soon learns that the cavesson is still on his face, and pressing most uncomfortably.



Top, riderless horse carrying machine-gun pack is led over jump. Bottom, a troop plays "follow the leader"; this herd instinct of horses is used by the cavalry at every phase of training





By the end of a week the average mount will be walking, trotting, galloping at command; and is never quite sure just which day the cavesson was left off.

The second week the rookie horses will be ridden in a group through simple maneuvers. All the time the regimental band is practicing nearby, bugles are blowing intermittently. Hearing them casually at first while training, the horse becomes so accustomed to them that when he takes part in his first parade, he hardly realizes the band is blaring almost in his ear.

Any tendency to shy at the music will be dispelled, in most cases, by the fact that these noise-making instruments are carried by other horses, who seem not to

(Continued to page 147A)



*Top, a platoon charges while firing at targets. Jumping, center, is everyday event to cavalry horse but he began by walking over rail. Below, riding hard to tire horses before practice*



## Circular Window Revolves to Open for Ventilation

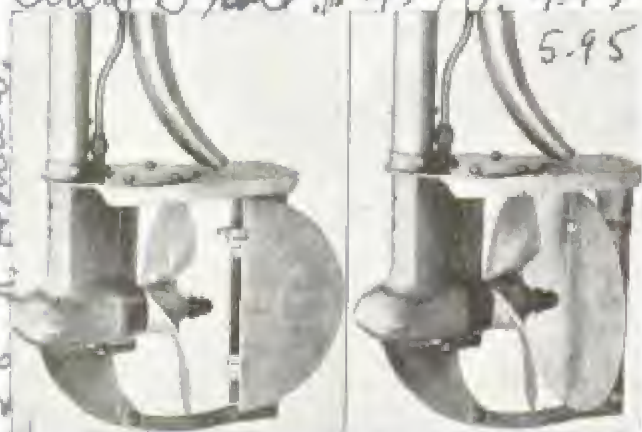


To open circular window, its lower half is rotated upward. Window frame and all are factory-built

Its lower half rotating on a center pivot for ventilation, a circular window that conforms with almost any architectural style can be locked in closed, half open or fully open position. It is furnished complete with frame, prefitted window, weath-erstripping, screen and hardware.

## Trolling Plate Controls Speed of Boat Automatically

Made of lightweight, rustproof metal, an automatic trolling plate controls boat speed to the slow pace desired by the an-

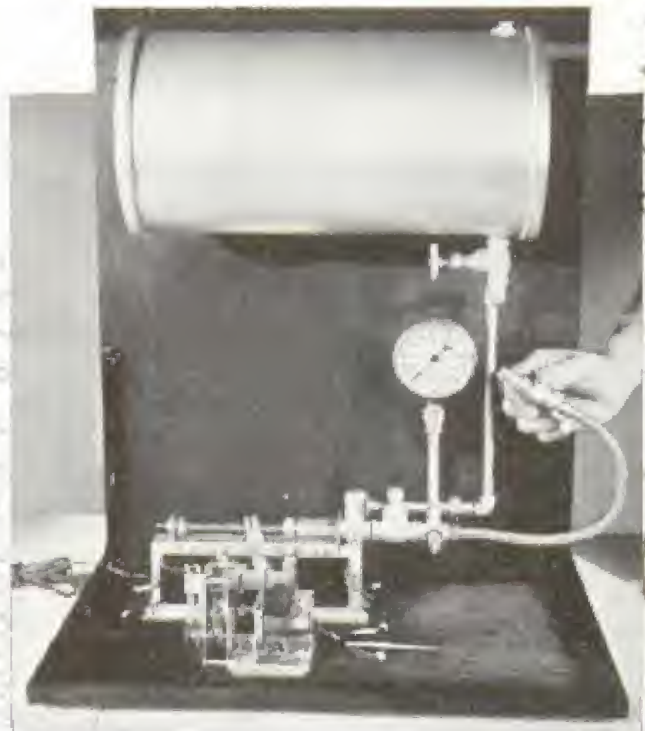


Trolling plate in two positions: left, full speed, and right, trolling speed

gler. It is attachable to all popular makes of outboard motors and is manufactured in sizes to fit any marine motor up to eight and one-half horsepower. The two halves of the plate close together at high speeds, doing away with the tendency of the boat to nose down in front—one of the problems encountered in the use of some other trolling plates.

## Scale Is Removed from Boilers by Chemical Injector Pump

Shutting down boilers to clean out scale formation is eliminated by a pumping unit that injects chemical compounds into the hot-water and steam systems to dissolve and remove the scale. A tiny variable-



Injector pump at base of unit forces solution from tank into boilers to dissolve and remove scale

speed motor with current consumption of only two watts operates constantly and may be adjusted to control periodical injections, which can be varied to meet the need in each individual case. Solenoids supply the pulling power to operate the pump, which has sufficient force to send liquid into a boiler against a pressure of 250 pounds. After being reduced to a powder by the solvent, the scale passes out through the waste line. Special chemicals used are non-poisonous and will not injure gaskets or metal. The unit will also pump many other liquids, including oil or water.

Curtis Companies, Inc. of Iowa.  
2830  
Chimble & Toll Co.  
2428 N. Harvard.

Chicago  
W. Addison  
Laboratories, 2018  
James Research

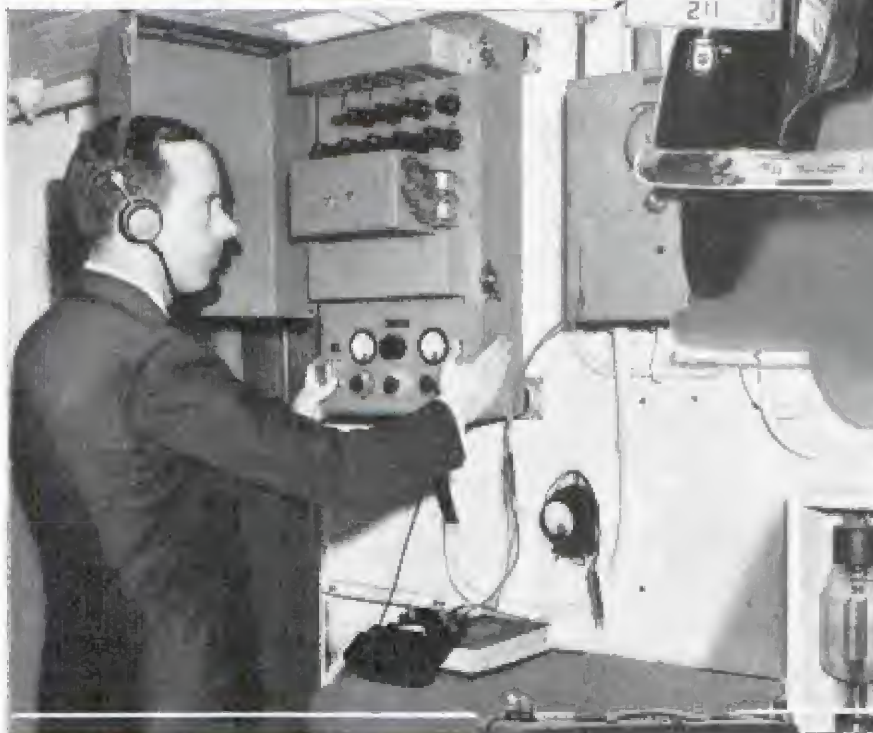
Spokane, Wash



# Radio 'G-Men' Police Short and Long Waves



*Left, chief inspector at San Pedro monitoring station watches oscilloscope which gives continuous picture of radio waves, indicating whether studio technicians are controlling sound equipment properly. Below, a radio "G-man" attempts to obtain directional bearing on unlicensed station with portable instrument*



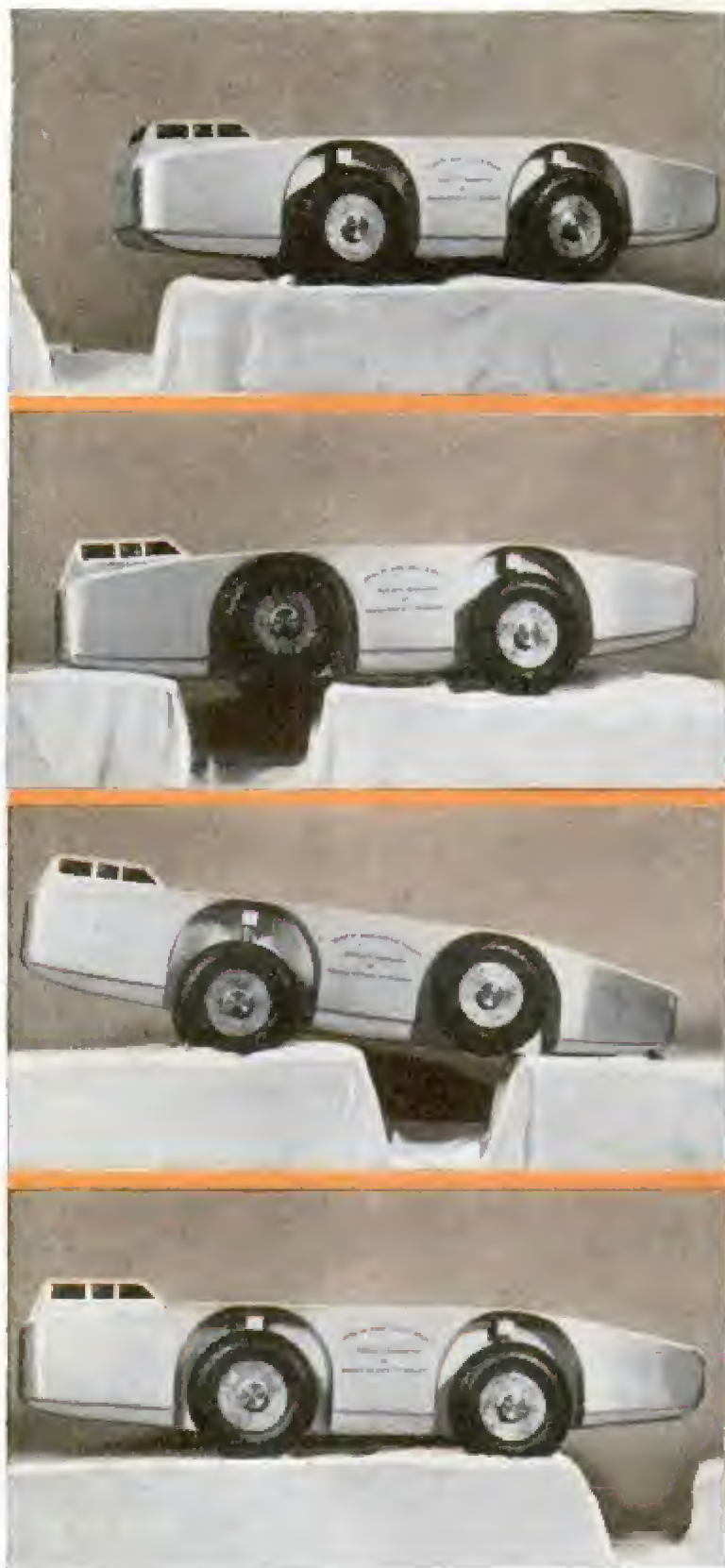
*Left, testing robot device on ship which picks up distress signals while radio operator is off duty and automatically sounds alarm. Bottom, recording a program which is suspected to be contrary to the public interest*

There are "G-men" riding the radio waves, tracking down "out-law" operators who trespass on forbidden frequencies or chatter without a license. The Federal Communications Commission maintains seven monitoring stations, whose duty it is to inspect radio equipment of ships, record and report broadcasts of objectionable nature, listen in on programs and see that sound technicians are keeping the music "sweet"—the radio waves under proper control. These pictures show the radio patrolmen at the San Pedro, Calif., station

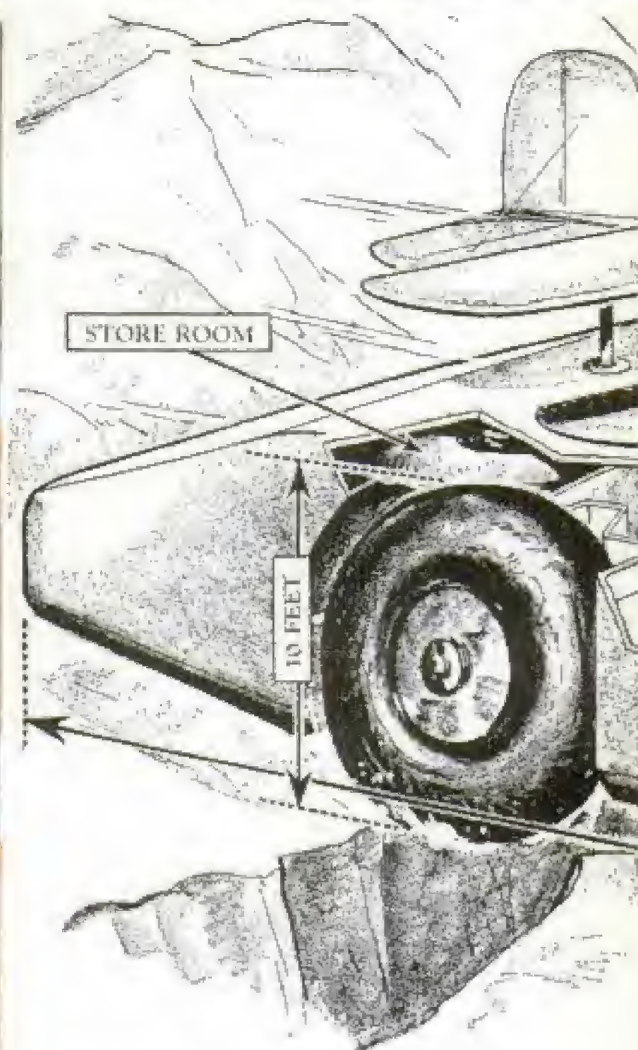




# SNOW CRUISER



Here's how the snow cruiser will cross a crevasse in polar ice fields. At top the model approaches the "abyss"; as front wheels drop into it, they are retracted and nose of cruiser slides on ice beyond while rear wheels furnish power. When front wheels reach opposite side they furnish traction and rear wheels are drawn up, cruiser sliding on tail. In bottom picture wheels are in normal position and the big bus proceeds on way

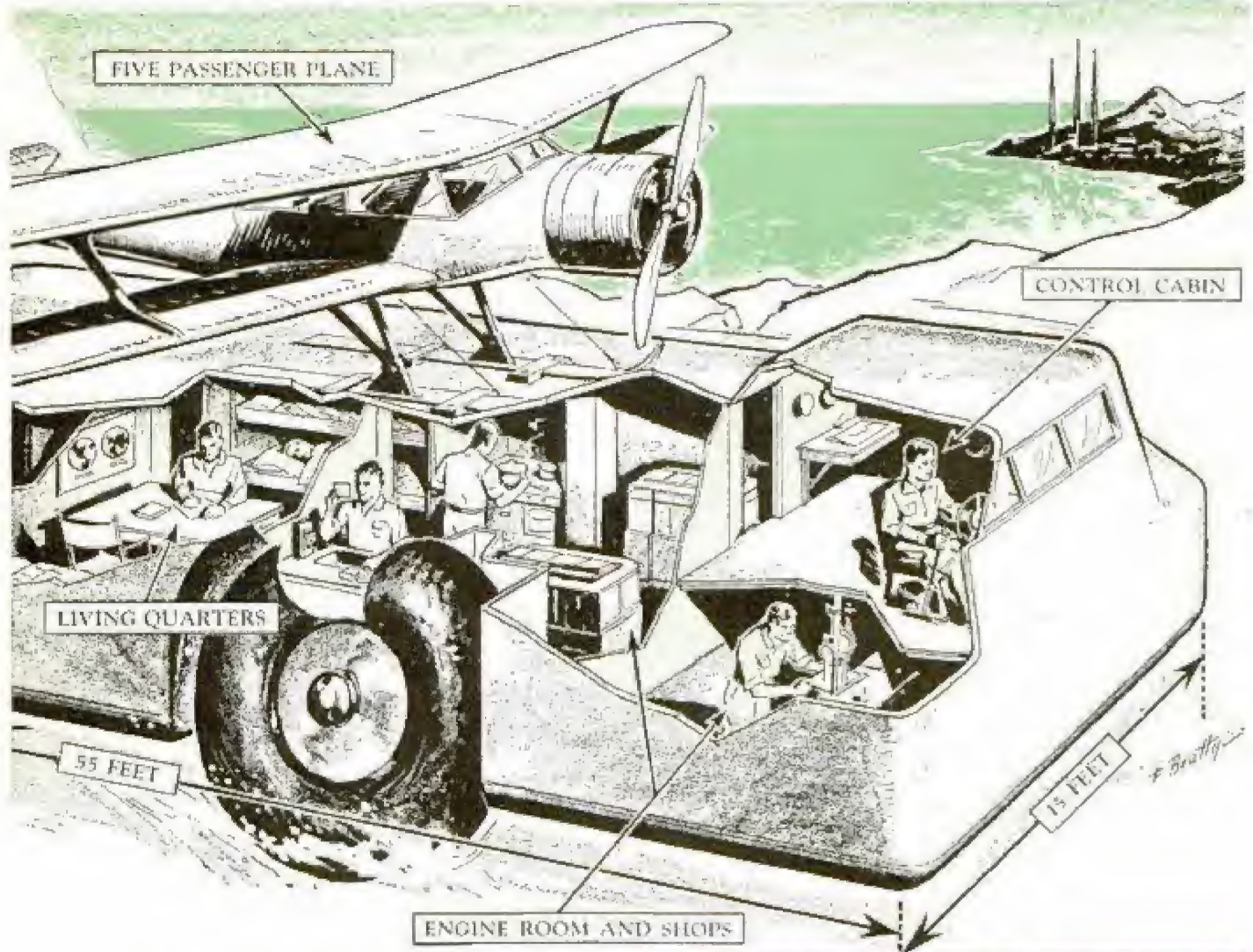


**I**N A Diesel monster that can climb the polar mountains and slither across giant crevasses, four American scientists will spend the coming Antarctic summer exploring the bottom of the world. Fueled and provisioned for a year "on its own," the Antarctic Snow Cruiser designed by the staff of the Research Foundation of Armour Institute of Technology, Chicago, under direction of Dr. Thomas C. Poulter, will carry on its back a five-seat cabin biplane to be used for mapping and exploring a 600-mile strip across Antarctica, with the cruiser as its moving base. Scientific director of the Foundation, Dr. Poulter was second in command of the Byrd Antarctic Expedition II, when he conceived the idea of the snow

33rd. Federal  
and Dearborn



# to EXPLORE ANTARCTIC



cruiser, and he will be in charge of it during the forthcoming government expedition. Fifty-five feet long and fifteen feet wide, the cruiser will have four wheels, each inclosing an electric motor, wearing pneumatic tires ten feet in diameter and a yard wide. Two 200-horsepower Diesel engines directly connected to generators furnish power for driving, for radio, electric stoves, heat and the machine shop. Flexible controls permit the operator to direct the power of one or both engines to any combination of one, two, three or four wheels. Each wheel is independently adjustable vertically four feet so that the huge "bus" can ride high above the snowdrifts or slide on its undersurface. Reaching a crevasse as wide as fifteen feet, the cruiser will push its nose across until the front wheels are on the brink

(Continued to page 151A)



Cutaway drawing at top shows arrangement of expedition's traveling base; notice that kitchen, just aft of engine room, doubles as photo darkroom. Below, Dr. Poulter with a model of the snow cruiser he conceived



## Super-Streamline Boat Has 500 Horsepower



Hoping to set new speed records for motorboats, Hans Stuck, a famous German auto-racing driver, is making trial runs at the controls of a new streamline speeder called "Tempo." The boat is equipped with a sixteen-cylinder motor generating 500 horsepower, produced by the Auto Union.

*German speedboat with 500-horsepower, sixteen-cylinder engine will be raced in an attempt to capture world's speed record on the water*

## Locomotive Model Run by Steam Pulls a Half-Ton Load

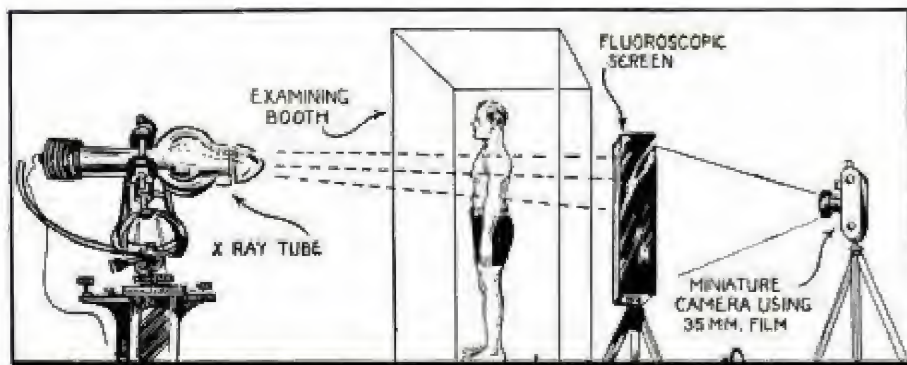
Working in spare time during afternoons and evenings, a Kentucky miner in four years completed a miniature locomotive that runs by steam just like its full-size brother, coal being used for fuel. With a steam capacity of ninety pounds, it hauls a load of 900 to 1,000 pounds on the three and one-half inch gauge track. Throttle and reverse control are located in the cab. Weighing 225 pounds, the engine is five feet eight inches long and fourteen inches high.



*Powerful enough to haul 1,000 pounds this miniature locomotive develops ninety pounds of steam. It was built by a miner in spare time*

## Ten-Cent X-Ray Pictures Are Made on Thirty-Five Millimeter Film

By using an ordinary miniature camera and thirty-five millimeter film an Illinois physician has developed a method of making X-ray photographs of patients at a cost



*Diagram shows set-up for making X-ray picture of patient at extremely low cost, by focusing ordinary miniature camera on fluoroscopic screen*

of about ten cents a picture. This extremely low cost is achieved by eliminating the usual fourteen-by-seventeen inch X-ray films. The person being examined stands in a small booth and the miniature camera is focused on a fluoroscopic screen on which the X-ray tube throws the shadow of the patient.



# Ride 'em, Cowboys!



RIDING FOR A FALL—and this cowboy is heading for a hard one. Note single rein leading to the halter, with no bit in horse's mouth. That's just to make it harder for the cowboy to stick on the bronc.





A TICKLISH SPOT—but the rider's ready to jump as horse crouches just before falling backward in an attempt to crush the cowboy. Judge and pickup man stand by awaiting the climax of this dangerous moment.

Cont. Thomas E. Stinson, Jr.  
10555 Holman Ave  
Los Angeles, Calif

478  
References: Cal. Prodehall,  
sen. mgr. Victorville  
Rodeo Assn. Victorville, Calif

**M**ODERNIZATION of the wild-west rodeo, the traditional sporting event of American cowboys, is creating a new kind of entertainment that has grown 500 per cent in the last five years. Half a million people watched the big show held in Madison Square Garden, New York City, last year and approximately 1,000 smaller rodeos are held in other parts of the country each year.

Smaller arenas that place the spectators closer to the performers, better staged shows, and the use of public-address systems for explaining fine points to the spectators, as well as the rough-riding horsemanship and the danger in the performances, help to explain why

the rodeo is growing in popularity.

One of the wildest rodeos of all, now becoming as well known as the shows held at Cheyenne, Pendleton, Calgary, Prescott, Salinas, and other round-up centers, is held every October in Victorville, a tiny cattle town on the Mojave desert in California. Victorville's reputation is based on its non-professional status. No cow hand who ever won an event before is allowed to compete. The result is plenty of action. Eighty per cent of the entrants are bucked off their horses, as against less than twenty per cent in rodeos in which professional stars compete. Thrills are practically guaranteed. The Victorville show draws upwards of 300 entries per year, some of





**STAYING ABOARD** a plunging horse (top) requires good balance, as well as real skill. Below, a bulldozer is shown leaping from his horse to the head of a steer that he will wrestle in an attempt to throw it. This is another dangerous stunt in the rodeo

the cowboys traveling from as far away as Texas and Montana to compete.

At this show, motion-picture stars from Hollywood sit in the stands as spectators. On the advisory committee are men like William S. Hart, Buck Jones, Death Valley Scotty, Harold Bell Wright, Irvin Cobb, and William Farnum. Cal Godshall, a local cattle rancher, is in charge of the community event, and Art Manning, former champion cowboy, is arena director.

In spite of its modern dress the Victorville rodeo is practically the same performance that rodeos were nearly a century ago when cow hands and ranchers first started to compete to decide which were the best riders and ropers in their localities. New stunts have been added and others refined, but events such as bronco busting and calf roping are still expert performances





of routine chores on the range.

"When a man sticks on the saddle of a four-legged earthquake for the required time, he's had a boneshaking ride he never forgets," Art Manning remarks. "The odds are against him from the start. He has only one rein to the halter and there is no bit in the horse's mouth. The rules are that the rider must continuously rake the horse with dull spurs during the ride and as if that wasn't enough a flanking cinch, a loose rope around the stomach, is put on every bucking animal to furnish a source of annoyance that makes him automatically try to throw the rider.

"It's a rough, dangerous game and most cowboys stop competing by the time they are thirty years old. The chances are, during his career, that a performer will be bucked off many times and probably badly injured more than once. Few horses are vicious but if a man happens to be thrown forward over the head he lies right in the path of four powerful hooves at the end of the next jump. He's almost bound to be hurt and he may be killed."

Are there any wild brones that have never been ridden? Most cow hands agree with the



**RODEO QUEEN** at least seventy-five times, Jean Godshall exhibits a bit of spectacular riding. Left, preparing to rope a calf for branding, one of the modern cowboy's less romantic tasks.







# 1577

501

old timer who remarked: "There never was a horse that couldn't be rode and never was a cowboy that couldn't be thrown." Horses as well as men have their off days and a champion buckster that is unbeatable one week may fail to throw a rider the next. "Five Minutes to Midnight," supposed to be the best bucking horse in the United States today, has been ridden a few times, but no rider who has vanquished



**ROPING A STEER** and doing a neat job of it is another rodeo stunt. At top, note that rider at center has his lasso placed. Right, wild Brahma bull tossing rider as loose rope around animal tore free.





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**RIDING HIGH** is this cowboy as the wild steer leaps into the air in an attempt to shake off the rider who clings to his perilous perch with only one hand.

this wild animal once would guarantee to do it again.

The strenuous show that a bucking horse puts on is a natural one and the animals aren't trained to be that way. They are simply wild stock never broken to a saddle or rider. A good bronco is worth more than a mere saddle horse simply because of the show he puts on. Cowboys notice that the animals seem to enjoy their own performances and make a game out of it. Many a veteran bronco, if he hasn't been able to throw his rider, calms down as soon as the whistle blows, seemingly knowing that the show is over.

More dangerous than trying to ride a saddle bronc are the bareback Brahma steer rides in which the cowboy can hang on only to a surcingle or loose rope around the animal's body. The extreme peril lies in the fact that after the steer bucks a rider off it frequently tries to gore or jump on the fallen man.

When that happens the rodeo clown rushes to the defense of the stunned rider. Every rodeo







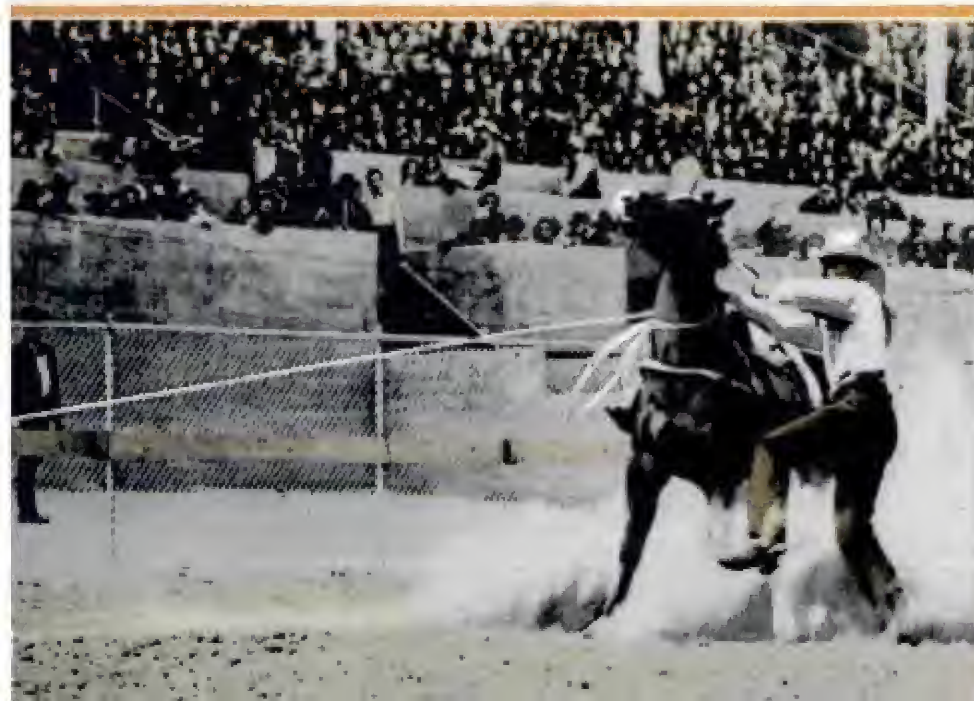
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has a clown who provides amusement during dull periods but his chief duty is to save lives. When a Brahma tosses a man from its back the clown goes into action at once, howling at the steer and waving a shawl to attract its attention. The clown's ungainly antics in dodging the enraged animal look funny to the spectators but the play is in deadly earnest. Clowns have saved the lives of many contestants.

Bulldogging, also called wild steer wrestling, is another dangerous act. The animal comes out of the chute at a fast run, with a hazer on horseback at one side to keep him running straight and the mounted cowboy on the other side. Watching his chance, the

**CAREFUL, COWBOY!** That horse is up to no good (top). The rider's trying hard to stay aboard. Bottom, calf-roping event. Trained horse is tightening on lariat, while rider is on the ground getting ready to tie the calf after it is thrown. Perfect timing is essential here. Cal Godshall Photo







Natural Color Photo—Courtesy American Airlines

504  
**OLD AND THE NEW** in transportation on the western plains meet as two riders wave a greeting to the pilot of an American Airlines ship. Below, cowboys going about the unexciting task of branding a calf on a western ranch. Each ranch has its own peculiar mark by which any animal it owns may be distinguished.



cowboy dives off his horse to the animal's head, stopping the steer in its tracks and wrestling against the horns until the animal is thrown. The bull weighs six times or more the weight of the man, yet the man usually subdues the animal. But if he slips or fails to get the steer down in a few minutes the tables may be turned and the cowboy badly injured.

Roping events test a cowboy's skill at his ordinary work. On the range the cow hands have to rope, throw, and tie calves and mavericks so that they may be branded. In the rodeo, prizes are awarded according to the length of time required, various events being for one man to rope, throw, and tie a calf, to do the same with a steer, and for a two-man team to perform the work on a loose steer. A top roper may need only fifteen seconds to throw  
(Continued to page 128A)



# Plastic Auto Roof Is Called Trend in Design

That the automobile of tomorrow may have body, roof and fenders made of plastics is the possibility held out by experts who have seen one late model fitted with a transparent plastic top. This car, prepared for demonstration purposes, permits full visibility to passengers and allows sunlight to reach the occupants, yet shields them from wind and rain. It is not beyond the realm of possibility, experts point out, that plastics strong enough to withstand severe impact, perhaps as strong as steel, may be available for the manufacture of auto tops in the not too distant future. These plastics might be produced in the color desired, eliminating the necessity of repainting. Hand in hand with the plastic roof may come the plastic body and fenders, also made of strong, lightweight material that would be easier to shape than metals, that would offer as much protection to the occupants as all-metal cars and that might be no more expensive. Automotive men have been cautious in commenting on



Two views of demonstration automobile fitted with a transparent top of plastic material. (Courtesy Briggs Body Co.)

the use of plastics, preferring to await the coming of a synthetic material that would meet rigid requirements of the industry.

## Four-Blade Aircraft Propeller for Fast Pursuit Planes



Four-blade propeller of smaller diameter undergoing test on high-speed army pursuit plane

To utilize the increasing power of aircraft engines without adding to the length of propeller blades, a four-bladed propeller has just been developed. Motors of constantly increasing horsepower and higher-altitude flights demanded a larger effective blade area, particularly for the high-speed pursuit planes of the army. Blades of larger diameter would mean heavier landing gear, so the four-blade type was designed by the Curtiss organization as the best answer. It will make possible closer spacing of engines on the multi-motored bombers and transport ships with resultant saving of weight in the wings. The aluminum alloy blades are electrically controlled for pitch.

There were 2,326 airplane landing fields in the United States on July 1, 1939, 730 of them lighted for night use.

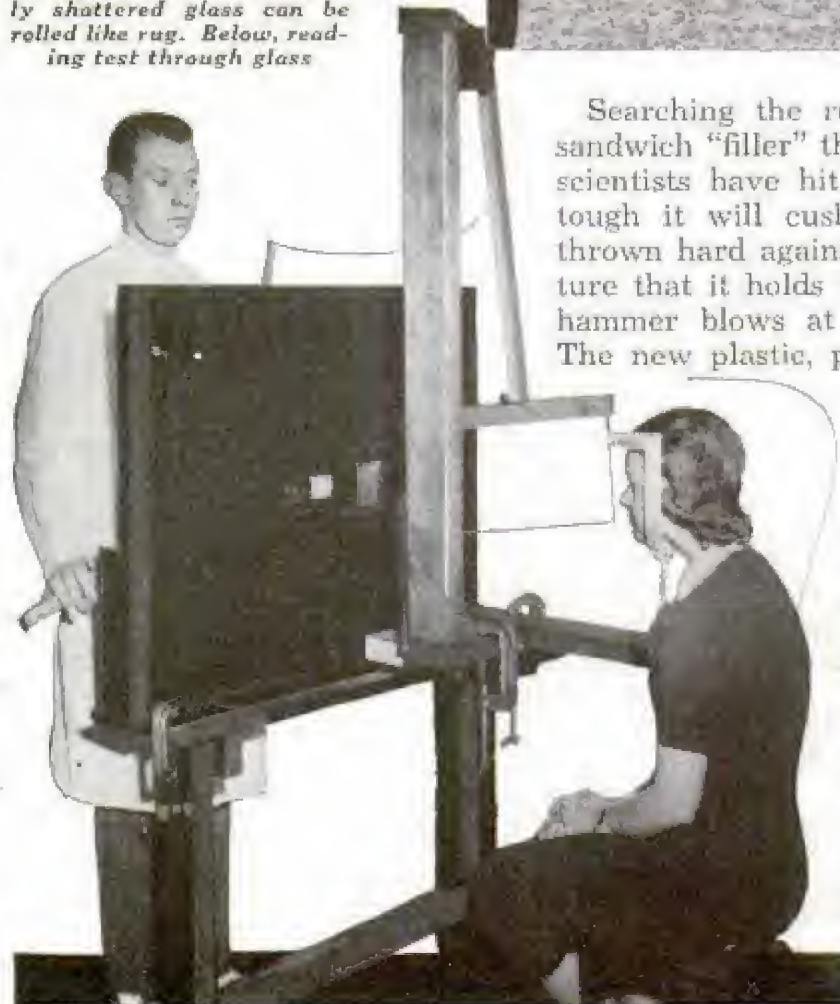
Curtiss Wright Corp.  
Cleveland, Ohio 7/1/39

New York

Curtiss Wright Corp.  
200 Crotonchapel



## Elastic 'Sandwich' Cushions New Safety Glass



Searching the realm of synthetic resins for a sandwich "filler" that will make safety glass safer, scientists have hit upon a rubbery substance so tough it will cushion and hold a bowling ball thrown hard against it, so indifferent to temperature that it holds laminated glass together under hammer blows at zero or tropical temperature. The new plastic, polyvinyl acetal resin, becomes transparent when placed between two sheets of one-eighth-inch glass and subjected to high pressure in a hot-oil bath. First laminated glass to appear in automobiles was cemented with a cellulose-nitrate filler which turned brown and clouded in sun and moisture. Cellulose acetate, introduced about 1933, proved more satisfactory but the polyvinyl plastic is tougher, more resilient, and permits the use of thinner glass. Non-shatter glass made with the new plastic is called high-test safety glass, and high-test safety plate will make its de-

Wilmington

Butasite-  
Paul P. S. Remond Co



## Sun Seat on a Circular Track Turns Its Back to the Wind



Canvas weather vane keeps glass sundeck facing away from wind, turning it on a circular track. Only the front is open.

For siestas in the sun with full protection from chilling winds, a sun deck that revolves on a circular track has been built on a Connecticut estate. Glass sidewalls, back and roof let in the maximum sunshine while the open front is kept always away from the wind by the canvas weather vane projecting overhead. Even a slight breeze will turn it.

*Mrs. Lahlia Loeb, Redding.*

## Eight-Wheel "Dachshund" Bus Carries 120 Passengers



One-hundred-twenty passenger bus stretches nearly to width of cathedral.

Built like a "dachshund," a sightseeing bus of tremendous length and low center of gravity was manufactured to order by a German automobile company. Its trailer, with double doors at the center carries 120 passengers.

Living organisms asleep in the frozen soil of Siberia for 20,000 years are said to have been revived by Russian scientists.

*Paul's Photos.*

*Ball. Union*

*4232 Nicholas Blvd. Toledo, Ohio.*

*2864*  
*Architectural Forum*  
*July 1939*

*Designed and executed by Hans Cetto, St. Louis.*

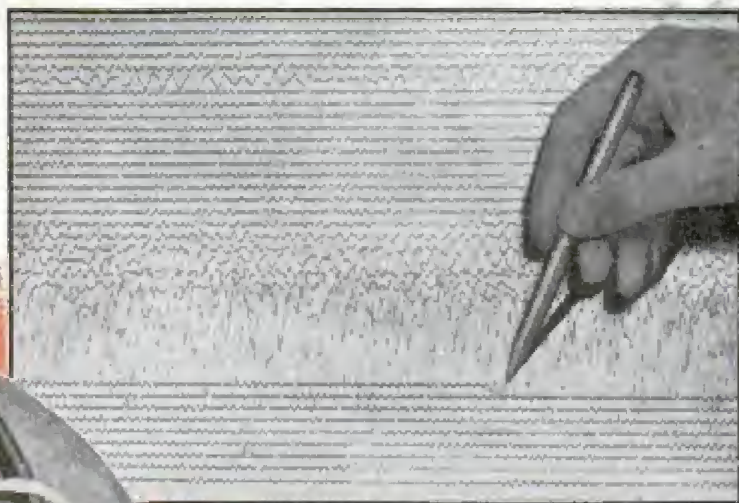
*Official news agency.*  
*Refugee give air conditioning.*



2-5

Andrew Harnick  
1509 S. Beverly Glen Blvd  
W. Los Angeles Calif

# WATCHING MOTHER



Left, finding epicenter of earthquake by plotting data from two seismological stations on globe. Pencil points to start of sharp quake on seismogram, above. Below, tilt meter testing Japanese theory that earth's surface tilts slightly before every tremor



**A**MONG the natural phenomena that terrorize and fascinate man, earthquakes are unique. Weather reports tell when a blizzard is brewing; a falling barometer forecasts a hurricane; subterranean rumblings indicate volcanic eruption. But a destructive earthquake strikes without warning.

Old Mother Earth is never at rest. It is estimated that 30,000 temblors are felt each year, and delicate scientific instruments record thousands more. Major quakes rock the globe every six or seven days.

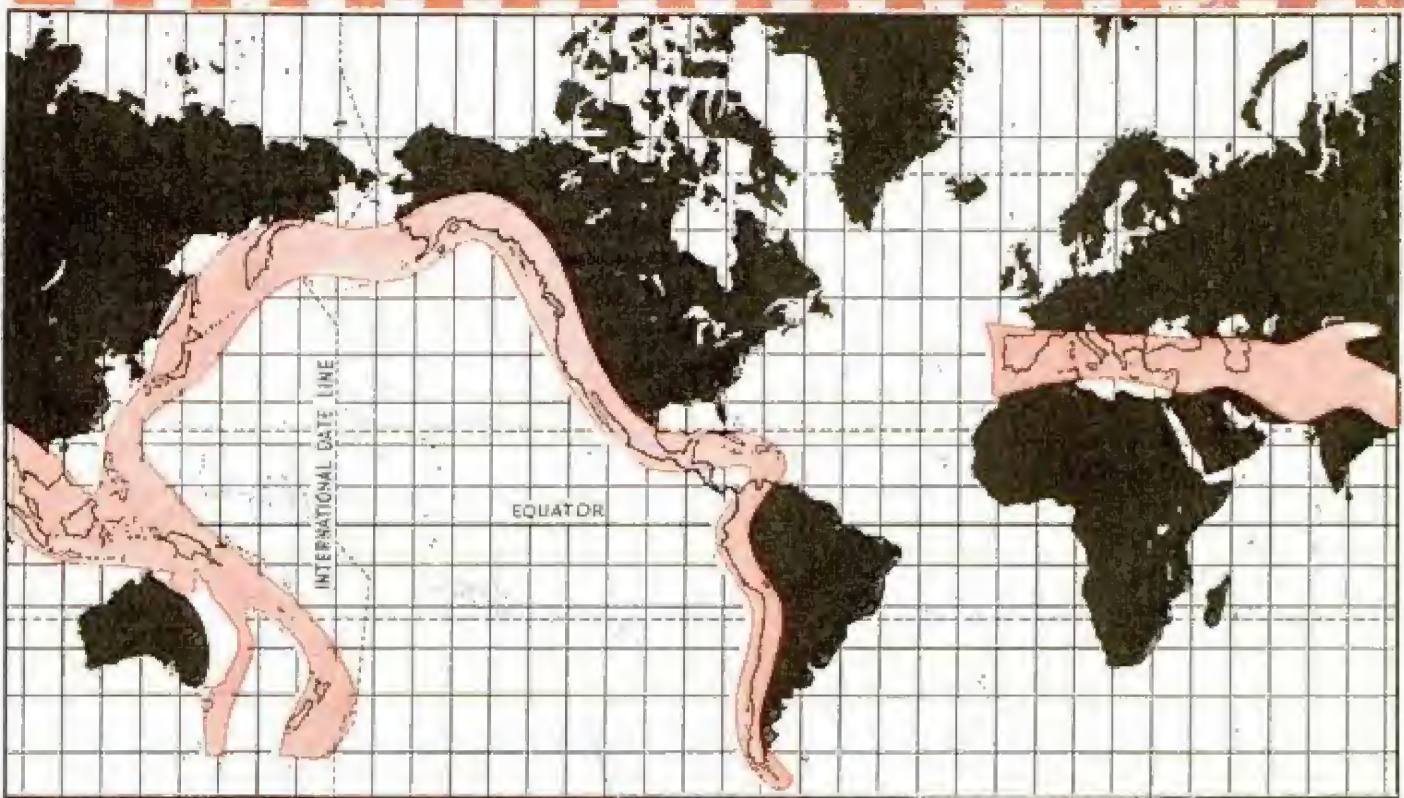
Because our great cities cover only a fraction of the land surface, major earthquake disasters occur only once or twice

a year. The majority of violent shocks occur in mountains, jungles, polar regions, or underseas where they do little damage. When a sharp quake jolts a metropolitan area, however, it may destroy millions of dollars worth of property and take hundreds of lives.

In a concerted effort to learn where



# EARTH'S PULSE



earthquakes will strike and how to prepare for them, science has established more than 350 seismological stations around the world. About fifty are located in the United States, principally on the Pacific coast and in New England. Two of the best-equipped stations are in California: one on the Berkeley campus of the University of California, the other at Pasadena under the joint sponsorship of the Carnegie Institution of Washington and California Institute of Technology. At Berkeley there are thirteen seismographs under the watchful eye of Prof. Perry Byerly.

The Seismological Laboratory of California Institute of Technology is directed by Prof. Beno Gutenberg. A number of associated stations make daily records and send them to Berkeley or Pasadena. These centers then exchange records. Seismologists study the seismograms under the microscope, interpret their zigzag



Areas in red on map at top of page indicate the earthquake belts of the world. Below, engineers test strength of a building with a vibrator. Scientific study has shown men how to make the largest buildings quakeproof





lines, and file the records. The University of California has a library of more than 80,000 seismograms.

Only during the past ten or twelve years have precision instruments been in general use. Seismographs record the time, direction, amplitude, duration, and other characteristics of the tiniest temblor. Some instruments are so delicate that they record traffic vibrations, and footsteps.

The principal feature of all seismographs is a suspended pendulum which tends to remain motionless even though the frame from which it hangs is severely jarred. Fastened to this pendulum is a delicate pencil, or a mirror which throws a needle-



like beam of light. The pen or beam traces the earth vibrations on paper or film, which may be on a revolving drum. When there are no temblors, the pen or beam of light traces a straight line; during an earthquake, the drum jiggles and a zigzag line results.

Most seismological stations are equipped with three instruments, one oriented to pick up east-west vibrations; another responds to north-south vibrations, and a third, vertical vibrations. These instruments are mounted on concrete piers anchored to bedrock. Most seismological stations also have strong-motion instruments for recording major quakes.

Surface shocks arrive at the incredible speed of 7,200 miles an hour and other vibrations may travel three times



*Seismograph recording on film, top, housed in darkroom. Center, aerial photo of 275-mile San Andreas fault in California. Right, model of sixty-foot seismograph which measures earth's "stretch." Bottom, a quake*



as fast. Magnetic controls keep the drums turning at constant speed in spite of power fluctuations and earth shocks.

Since ancient times man has wondered at earthquakes. According to one primitive belief, the earth was disk-shaped and rested on the horns of an enormous bull. In turn, the bull balanced precariously on a large egg which lay on the back of a giant fish. When the bull was pestered by cosmological insects, he shook his head or wiggled an ear—thus causing earthquakes.

Science has a more rational if less colorful explanation. Forty or fifty miles below the earth's surface, rock is soft and plastic because of great heat and pressure. When lateral forces squeeze this material, it either flows out of a volcano's mouth like toothpaste out of a tube, or bulges beneath the earth to form mountain ranges. When this happens, the brittle outer shell cracks and slips. It is the fracturing of this solid crust that causes our biggest quakes.

When the earth cracks, it usually breaks along some line of weakness which geologists call a "fault line." Sometimes the shift is horizontal. During the great San Francisco earthquake of 1906, the area on the east side of the 275-mile San Andreas fault slid south, while that on the west slid north. Every road, pipeline, and fence crossing the fault was displaced—the largest shift being twenty-one feet. Often a vertical shift takes place. The Yakutat Bay quake in Alaska in 1889 resulted in an abrupt vertical displacement that lifted part of the coast forty-seven feet.

Smaller quakes are sometimes caused by volcanos. In Italy, Hawaii and the South Seas, outpouring of lava is often accompanied by temblors. The Dalmatian coast of the Adriatic is noted for quakes caused by collapse of limestone caverns.

When an earthquake occurs, vibrations radiate in all directions from the epicenter like waves from a pebble thrown into a lake. On seismographs three kinds of waves are recorded. The first are compression waves, akin to sound waves. You can often hear a large quake coming by the booming sound that precedes the actual shock. Next come distortion waves, so slight that they can hardly be felt. Finally, the devastating surface waves strike with all their fury.

(Continued to page 153A)

## "Fountain Pen" Shoe Whitener Paints Window Signs



With automatic feed for cleaning fluid, this white shoe dauber also is handy for lettering window panes

It is easy to clean white shoes with a "fountain pen" applicator that daubs the whitening fluid on with a sponge. A five-inch transparent "well" holds the fluid, and a valve feeds it into the sponge as it is pressed on the shoe. It is equally useful for painting signs on windows.

## Pipe Uses Cigarette as Filter to Trap Tar and Nicotine

Designed to trap tar and nicotine, the filter of a new pipe uses a cigarette as its element. The filter, it is claimed, results in a cool, smooth smoke. The cigarette is cut in half and inserted in two tubes in an aluminum chamber in the pipe. The aluminum is highly efficient for heat transfer and is a quick condenser of nicotine and tar-laden fumes. One cigarette lasts for a dozen or more pipefuls of tobacco and a new one should be inserted in the filter when the pipe begins to draw hard.



Two halves of cigarette lodged in pipe stem filter nicotine and tar from fumes and give cool smoke

L. and H. Stern,  
Pat. Pending



# Catapult Flings Man 130 Feet through the Air



Three stages in a thrilling aerial ride—boarding the catapult sled, taking-off and flying "solo"

Borrowing one idea from the ancient Roman military catapults and another from modern aviation, Walter Bura of West Orange, N. J., built a human catapult that hurls him 130 feet through the air into a lake. To protect himself from chafing as he "takes off," Bura lies on a sled that fits in the inclined frame of the catapult. When the signal is given, airplane shock cords yank the sled up with terrific speed and the human projectile flies out over the water.

## Flashlight Battery Runs Clock for Nine Months

Equipped with a thirteen-jewel Swiss movement, a glass-sided electrical clock now on the market runs nine months to a year on one four-volt flashlight battery. The clock movement is wound by the electrical drive at intervals of eighty to ninety seconds. The drain on the battery is compensated for in the mechanism so that the clock keeps accurate time. The clock has four clear glass sides sealed in the form of a dustproof pyramid.



## Eggs Treated with Mineral Oil Kept Fresh for Six Months

Put an egg through the vacuum-gas-oil treatment just developed by the Department of Agriculture and it will be virtually as fresh at the end of six months as it was at the beginning. Already in use commercially, the treatment is expected to equalize the seasons in egg marketing; in the winter, when hens are not laying so well, these storage eggs can be brought to market in as good condition as fresh eggs. First the air is drawn out of the eggs by vacuum, then they are dipped in mineral oil. Then, as the vacuum is released by introducing carbon dioxide, the oil is forced into the pores of the shells, and this slows up the loss of moisture and chemical changes in the eggs.

at World's Poultry Congress, Cleveland



# Motorcycle Radio Station Guides 'Blind' Pilot

Motorcycles with radio "feelers" thrust out several feet on each side are the mobile marker beacons of one blind-landing system for aircraft. These feelers are antennas that send up through fog or storm a vertical fan-shaped radio signal that is intercepted by the pilot as he flies overhead toward a landing. Several of these motorcycle beacons can be sent out quickly to take stations



Radio station on motorcycle sends up fan-shaped signals which guide pilot to safe landing "on instruments." Horizontal pole is the antenna

along the path of incoming planes, each sending up a different tone signal or showing a distinctive colored light to inform the pilot of his position. This motorcycle sig-

nal is, of course, only a part of a landing system that includes a glide path, localizer and marker beacon, guiding the pilot to port as if through a funnel.

## German Diesel Streamliner Travels 133 Miles an Hour

Streaking along at an average speed of about 124 miles per hour, the new stream-

line express train built for the run between Berlin and Hamburg, Germany, has

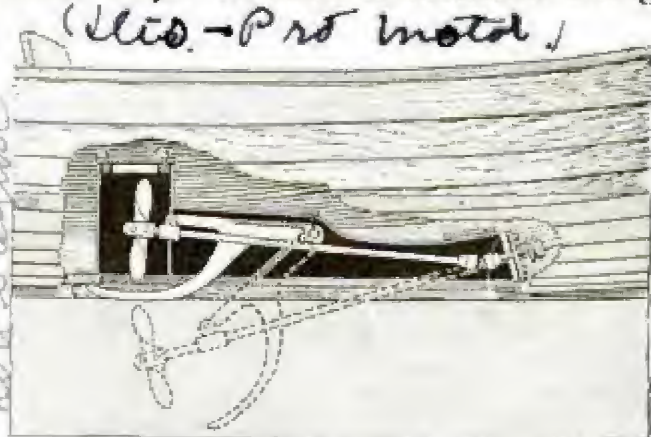


World's record of 133 miles an hour is claimed for this 1,200-horsepower Diesel streamliner train running between Berlin and Hamburg, Germany

made its first test. A top speed of more than 133 miles was reached. Two Maybach Diesel motors, developing 1,200 horsepower, drive the train, which is constructed in three sections. Besides accommodations for first-class passengers, the train has seats for 200 in the second-class compartment.

## Propeller Disappears into Hull When Boat Strikes a Hidden Snag

Snags and weeds and under-surface rocks are no menace to the disappearing propeller of a non-sinkable motorboat now on the market. A curved guard in front of the propeller engages any hidden obstruction before the propeller can be injured, and the entire screw shaft pivots upward, the propeller itself rising into a well in the bottom of the boat.



Propeller is retracted when guard hits obstruction

In an average year the automobile industry uses 25,000,000 pounds of wool, the product of 3,000,000 sheep.

Pontiac Owners Magazine

Boat \$550.00

Creighton W. Pate, Ed. Canada





*Combined bands of Yale and Harvard  
in formation before a football game*

**A** SHORT time ago, a neglected step-child of modern music, today, a star—that's the latest chapter in the history of the band.

So swift has been the band's rise that musicians are at a loss for an explanation. A generation ago, every community boasted of a silver cornet band. Good musicians were scarce. Anyone who played an E-flat cornet could get a job in almost any town of his choice.

The march kings were big drawing cards. More than a million of their phonograph records were sold every year and crowds fought their way into the halls they visited on tours.

The war increased the number of band musicians but in the years following it the great marching bands began to fade from the national scene. The deathblow came

when people began staying home to tinker with crystal detectors and radio headphones, and later, when the screen found its voice. The radio and canned music began to loom as a two-headed monster that was going to throttle music. Players by the thousands were being thrown out of jobs. The musicians weren't the only ones who were hard hit, Frank C. Howard, band authority explains. Instrument sales were dropping off at an alarming rate. In desperation, manufacturers turned to schools. The Joliet, Ill., high school was one of the first big institutions to be sold on the idea of organizing a band to play at the school's football games. Others followed suit and, to pep things up, the manufacturers fostered a national band contest.

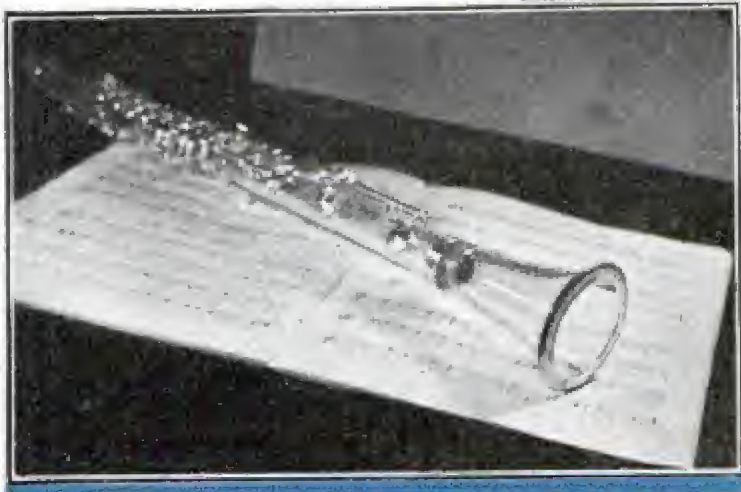
The 1923 event proved a success, twenty-five bands participating. Plans for the fol-



lowing year were turned over to a musical education group which sought to broaden the movement at the base by shelving the national meeting for a couple of years and concentrating on building up regional contests. In some towns, students bought instruments with their own money, in other places, luncheon clubs and civic groups footed the bills on the theory that a band was a good advertisement for the town, particularly when it was away on a football trip or attending a livestock show.

Those who went into the band work did so not with an idea of any professional career in the future, but simply because they liked music. A number of school boards saw the cultural and educational aspects of the movement and made it part of the curriculum.

Competent directors and instructors were retained, special equipment to round out the reed and brass sections purchased



Top, testing instrument with cathode-ray oscillograph to determine if it is in proper pitch and if scale is correct. Center, giant drum of university band. Bottom, clarinet of transparent plastic

and rooms with good acoustics made available for practice. But more important than these was the decision to give academic credits to those who took part in band activities.

It was full steam ahead for school bands. Nineteen thirty-two saw 1,050 high schools from forty-four states vying for honors in the state contests. Three classes were set up in the national contest so smaller schools wouldn't be competing against the larger ones and, in addition, competitions for soloists and small ensembles were placed on the program. A highlight of one

*Pedler Co. made a special order*





contest was the welding of 5,000 musicians into one great orchestra for a program of six numbers, concluding with "Stars and Stripes Forever." So band music is now a part of the lives of 2,000,000 students.

Naturally, the band movement has spread into other channels. The Rotarians, American Legion, and metropolitan police departments have gone in for bands to keep boys off the streets. When school books are put away, many of the school players gravitate into industrial bands, town symphonies, and lodge aggregations. They've helped make America the most musical nation in the world, at least, as far as actual participation in the art is concerned.

Growth in numbers, however, is only half the story. The brass band of yesterday has been supplanted by the symphonic band with a full complement of woodwinds and brasses, capable of turning in a finished performance.



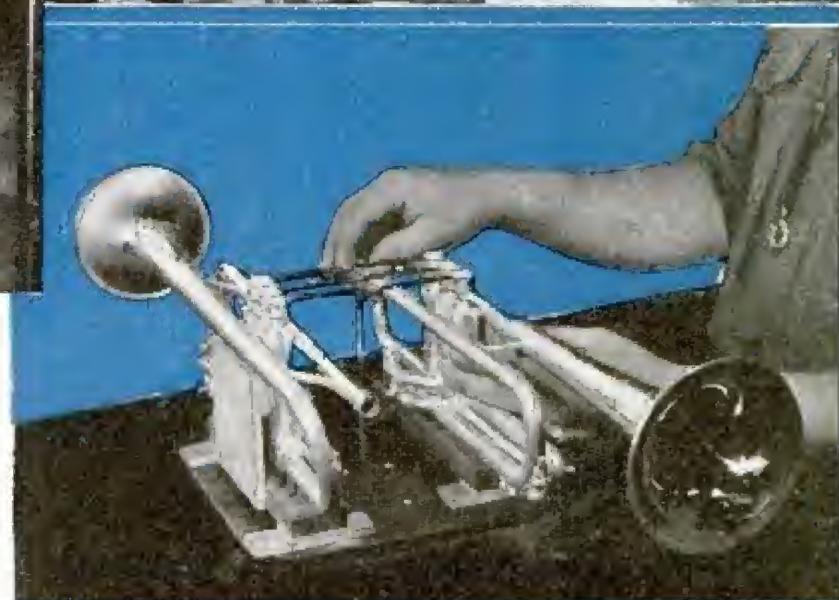
When the famous band leader, Edwin Franko Goldman began dipping into the classics, he set the style for hundreds of other bands, and the musical standards within the group were raised appreciably.

Bach's music, Goldman points out, originally was composed for the organ and since the band is more closely related to that instrument than is an orchestra, it is in a position to do a better job than the latter. Wagner, Saint-Saens, Verdi, Liszt—all sanctioned band arrangements of their works. Of the contemporary composers, Grainger and Ravel have written pieces expressly for Goldman's band.

Instead of destroying music as was expected, the radio has contributed to this renaissance in bands. For several years, the concerts conducted by Walter Damrosch and others have whetted the

*Top, typical test in Conn soundproof woodwind room. Center, delicate gauge which checks bore of clarinet to one-half-thousandth of an inch. Bottom shaping of a bell on a sousaphone as it is revolved at high speed. Applying pressure causes metal to flow in direction desired by operator*





musical appetites of youths, and Dr. Joseph Maddy's music lessons over the air have been responsible for the formation of countless bands. He gives a regular course weekly over a nation-wide hook-up with the aid of professionals who sound the correct tones, play simple tunes, and illustrate the solo work.

The widespread improvement in bands has created a demand for instruments which are lighter and faster in action, instruments easier to blow while at the same time offering greater smoothness and accuracy in intonation and richer tones. A piece of brass or nickel silver when bent gets wrinkles in it which distort the sound waves. Consequently, the tone of the horn isn't true and it's hard to blow. In doing away with these defects, engineers of

Top, left, giving music lessons by radio has aided advance of bands. Right, bell of instrument being shaped. Center, motor-driven fingers testing instrument in York factory. Bottom, molten pitch being poured into bells of instruments

(Continued to page 126A)



# Scarecrow's Spinning Arms Operated by Wind



With windmills for arms, this waving scarecrow is on guard over a farm in England

Whenever the wind blows, the mechanical scarecrow on an English farm comes to life. Mounted on a steel post, it has twin blades for arms that spin in the breeze.

## Half-Circle Convex File Has Safe Hand Grip

Made in the form of a half circle, a convex file is offered for shop workers, for



Convex file mounted on a half circle of hardwood is intended for filing protruding surfaces

use in filing protruding parts rather than smoothing a flat surface. It has a hard-wood handle shaped to fit the hand comfortably and provide a safe grasp.

## Rubber "Barrel" for Ice Cubes Keeps Them for a Day

When ice cubes are needed on a picnic or an extra supply is to be stored for party use, they can be kept from twelve to twenty-four hours in a rubber container now available. This "barrel" is made of soft molded cellular rubber, with walls one-half inch thick. Eight inches high and six inches across, it holds twenty-four to thirty-six cubes.



## Trays Rotate on "Ferris Wheel" for Easy Selection of Parts



Quick access to more than thirty bins is afforded by this "Ferris wheel" for the shop

Trays of many sizes, swinging cradlelike inside a wheel, provide a quick means for selecting small objects such as nails, clips, hooks, pins and pencils. Various types or sizes of tiny mechanical parts can be distributed in the eight troughs which contain more than thirty compartments.

Diagraph-Bradley  
Stencil Machine

Ind. Mr. Pearce, al. attor.  
near Newton, Mass.

Chicago Photo Dept

420 Lexington Ave  
New York

Verona Rubales Corp. Bedford

Also sold by Fred Harvey

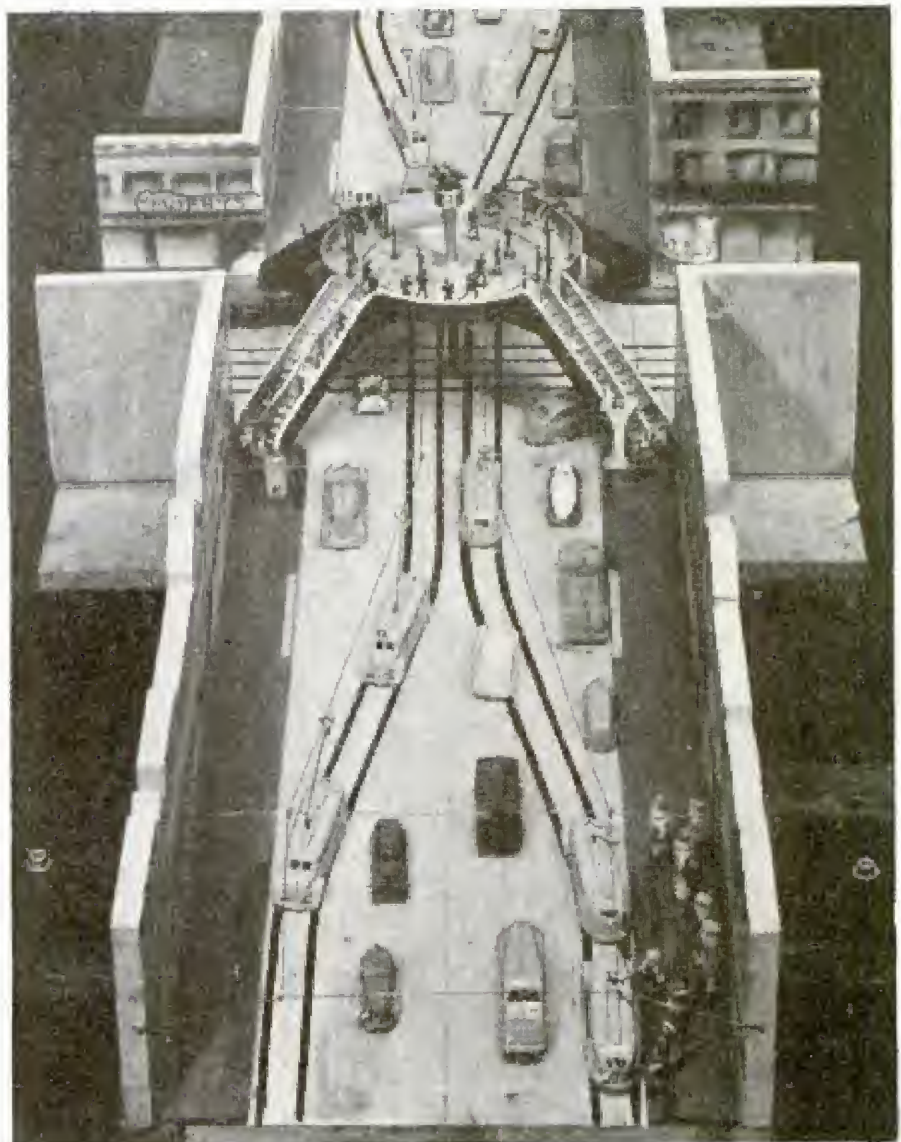
Clark Ave. St. Louis, Mo.

Illuro Metal Products Co  
2649 Kilgore Ave



# 'Turntable' Bridge Makes Street Corner Safer

Proposed as one solution to the congested traffic situations in big city shopping areas is a four-way escalator bridging street intersections. The moving stairways lead to a revolving platform which would swing the pedestrian quickly to the desired corner.



Escalators at all four corners and a perpetually moving turntable in the middle, as shown in this model, would speed traffic and save lives

## Way Found to Get Vitamin K from Tar

How to make vitamin K, which stops internal bleeding, has been discovered by chemists who sought to make available a larger supply than had been possible to produce heretofore. Coal tar is the new source and the chemists say that it holds the hope of giving to the world an unlimited supply, which means that thousands of lives will be saved each year. Previously the vitamin was extracted from alfalfa.

## U. S. Warship Hoists Canvas for an Extra 'Lift' of Speed



At the start of a journey half way around the world the U. S. gunboat "Sacramento" hoists sails to give its engines a lift from the wind.

It's an odd spectacle when a battleship wears sails. The U. S. gunboat "Sacramento" looked like a throwback to an earlier generation of warcraft as it left the Manila harbor recently with canvas hoisted to boost speed. The "Sacramento" was bound for New York by way of the Suez canal.

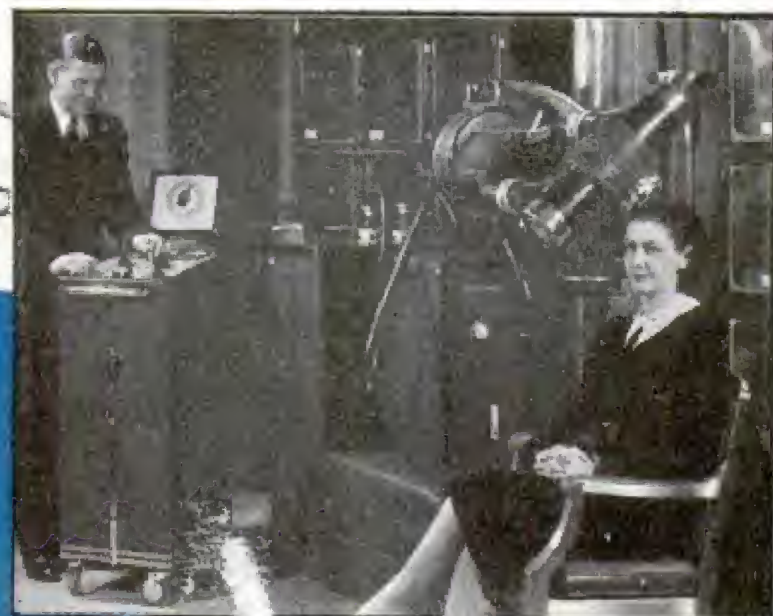
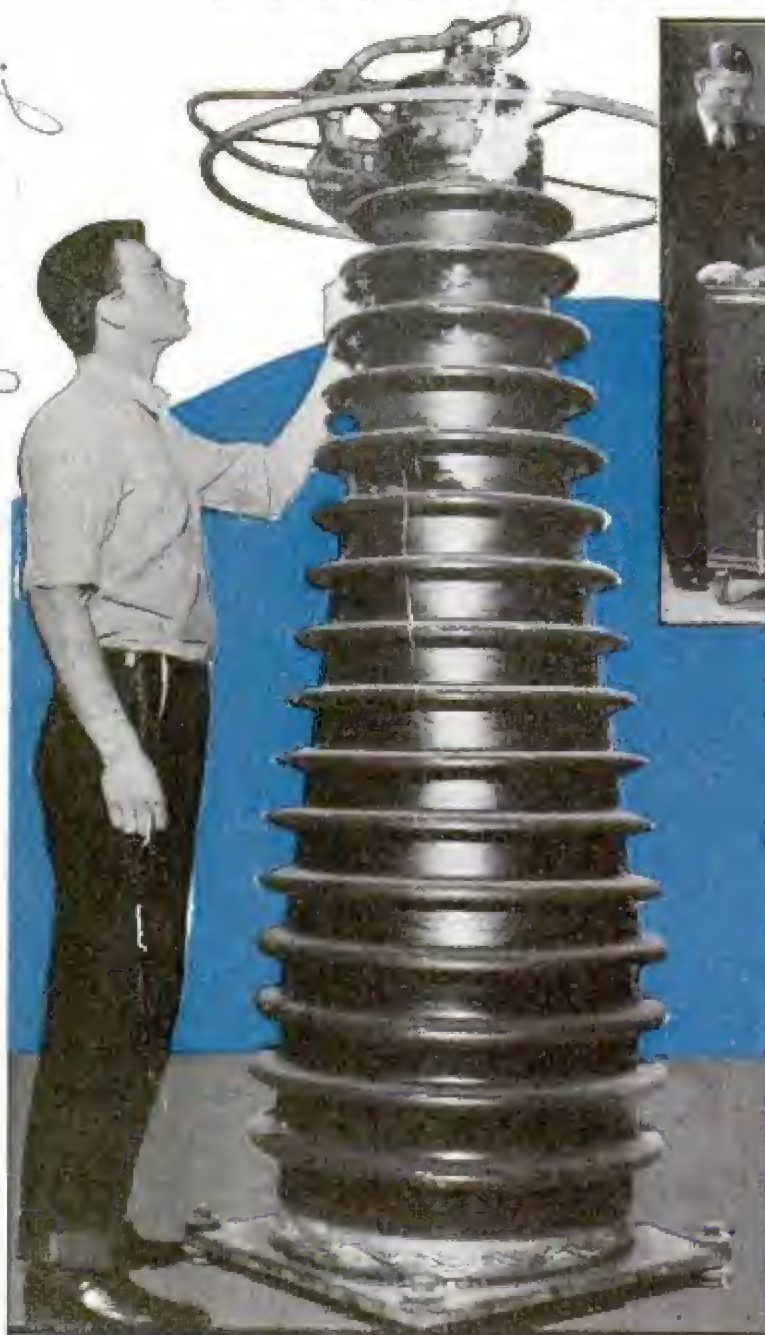
Eleven persons were killed every hour in 1938 by accidents in the United States.

*National Safety Council*



*Albion... Westinghouse... Calif. Co., 150 Broadway New York*  
*Anna*  
*Cent. Thomas & Harrison 10555 Holmanline Los Angeles Calif.*  
*light waves... X-ray is better violet*  
*Soiland X-Ray Clinic, 1407 7th St, Los Angeles*

# NEW WEAPONS *to*



Left, upper electrode of million-volt X-ray tube at California Institute of Technology. Right, new X-ray photography apparatus avoids slow time exposures and gives clearer pictures

**I**F YOU had lived 100 years ago your chance of attaining a ripe old age would have been only half of what it is today.

Life expectancy is increasing yearly because medical science is adapting many of the latest discoveries in physics and chemistry to the problem of keeping you in good health or restoring you to it.

Even astronomy has been enrolled in the battle against disease, for it was an astronomer who first discovered helium, the

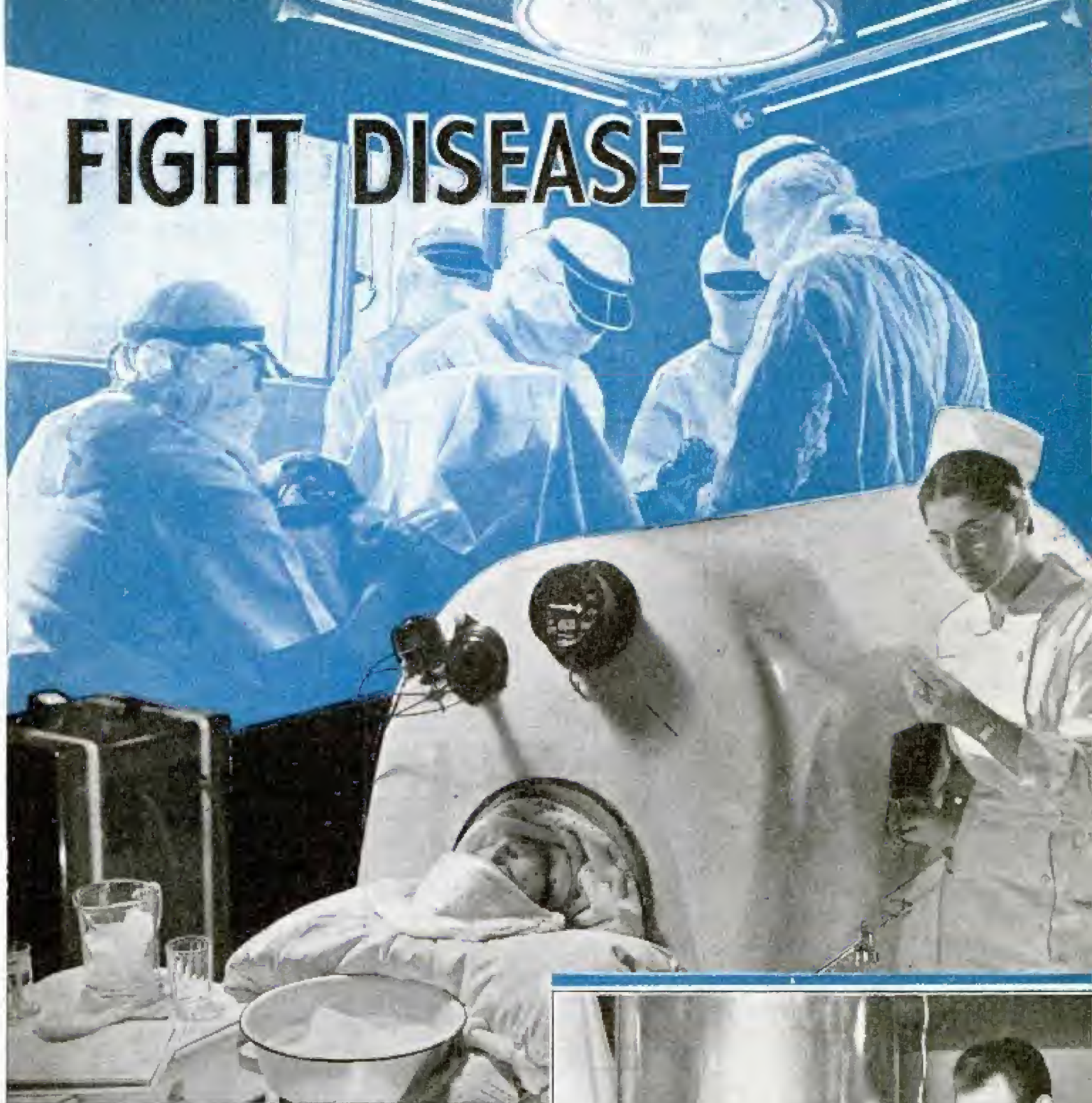
lightweight gas that relieves the paroxysms of asthma and that robs deep-sea diving of much of its danger.

One of the most interesting developments of modern medicine is that for many kinds of ill health doses of pure energy are being prescribed. Nearly every part of the energy spectrum from short-wave radio through heat, light, and ultraviolet to X-rays appears to have therapeutic value. It would have sounded like sheer nonsense a few decades ago for a doctor to order a patient to take so many doses of energy per week, but that is precisely what a physician is apt to do today. The wave length of the treatment that he orders depends on the type of complaint.

Cancer is one of the deadliest afflictions in the United States and at the beginning of the century nine out of every ten people attacked by cancer succumbed to it. Now nearly half recover. Doctors have learned to recognize it in its earliest stages and with surgery, X-rays, and radium they can often remove or destroy the growth. Today in dozens of clinics and hospitals super-voltage X-ray tubes that are a story or more in height are being employed to



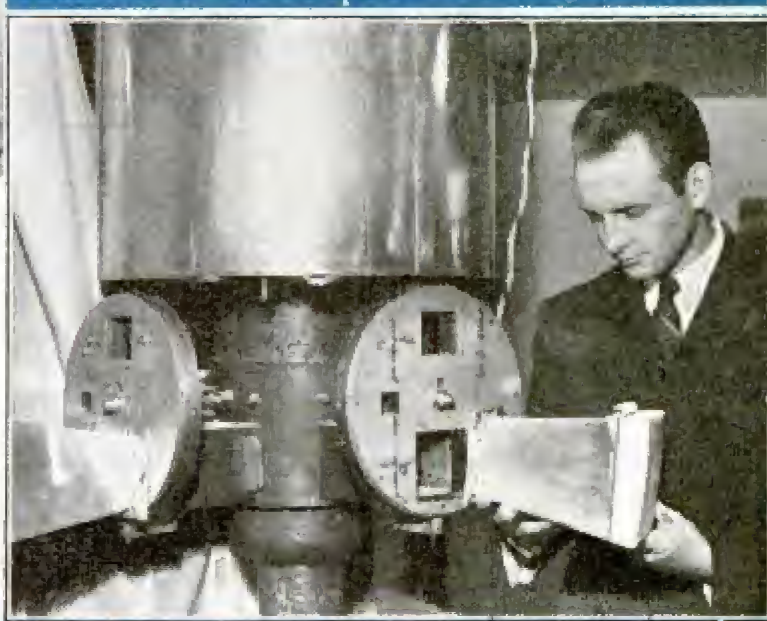
# FIGHT DISEASE



destroy malignant cancer cells without harm to the patients.

Physicists hope that they will be able to offer new kinds of treatment that will be even more destructive to cancer in the near future. At the University of California, Dr. Ernest O. Lawrence's powerful atom-smashing cyclotron is delivering streams of neutron particles that have greater penetrative powers than X-rays, and the chances seem good that neutron bombardment will become an important way of treating cancer.

Another possibility is the various elements that are temporarily radioactive. Physicists are learning to create or collect

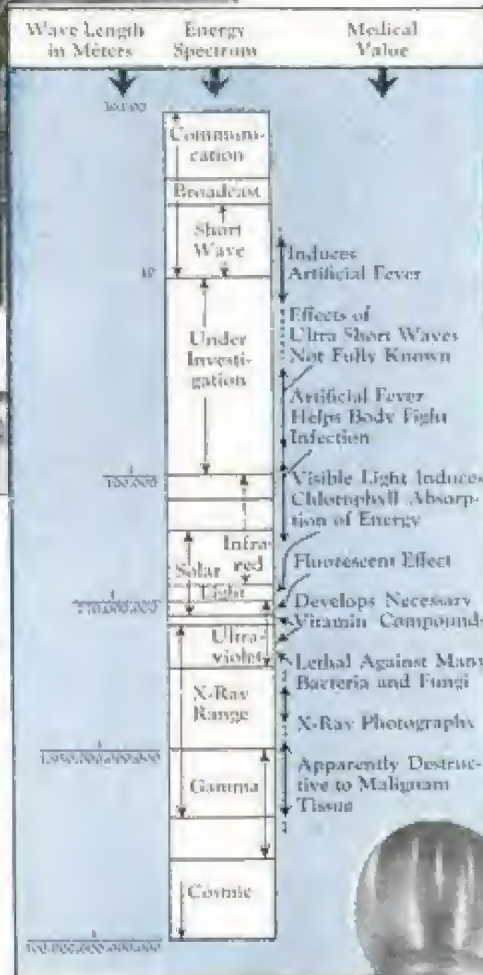


Performing operation under a battery of Sterilamps forming a square around the center light (top); fever machine in use (center), and X-ray tube's outlet portal being adjusted to help guide beam of radiation toward patient (bottom)





Top, adjusting electrodes of fever machine. Center, energy spectrum showing wave lengths useful to science in combating disease. Bottom, X-ray tube and transformer in giant new weapon designed to aid in war on cancer. By contrast, the nurse is holding a small photographic X-ray tube



these substances, termed radioactive because they radiate gamma rays just as radium does. Radio sodium, radio potassium, and other unstable elements lose their radioactivity within a few hours or days. Theoretically they are first-line weapons against cancer because of the hope that they can be injected directly into a patient's body where the gamma radiations can attack cancer at close quarters.

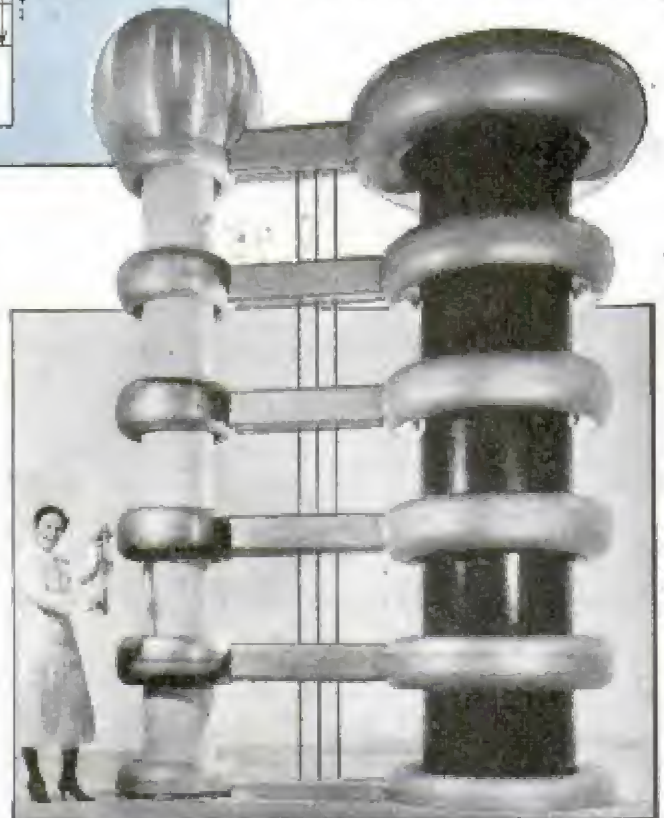
This same temporary radioactivity may soon supply the answers to a number of biological puzzles. The exact way in which the body makes use of food is not completely understood. By following the course of "tagged" atoms that are radioactive, biologists expect to obtain new knowledge of human chemistry.

The trouble with X-ray photography has been the long exposures that were required. Such exposures result in hazy

pictures that are often hard to decipher, due to movements of the heart and lungs. Recently Westinghouse engineers introduced a "candid" X-ray camera that gives off a vast amount of X-rays in a fraction of a second, something like the instantaneous light that is generated by a photographer's flash bulb. The result is that a radiograph may be taken so fast that heart action is "stopped" and a clear picture is obtained.

Heat is the infrared wave length of energy and fever is simply a rise in temperature that the body develops to fight off some kinds of infection. It is known that the heat causes an increase of white blood cells, allowing the body to put up a stiffer battle against germs. Some physicians used to inoculate patients with malaria germs in order to start a fever that would destroy other disease germs within the body, but now science has created fever machines that induce an artificial fever in the patient.

Fever therapy is still





2457

2751

*Bournemouth Model Airplane Club*

## Tiny Plane Rides 'Pickaback' on Seven-Foot Model Biplane

brand new but its results are already encouraging. Dry heat from infrared lamps or the moist effects of a combination hot-water circulating system and a water spray inside the fever cabinet bring a patient's temperature up to the exact temperature desired. In some cases medicinal drugs are administered while the patient is experiencing the artificial fever. Encouraging improvements in St. Vitus dance, some kinds of arthritis, syphilis, meningitis, and miscellaneous infections have been found.

Dr. Lee De Forest and others are studying the effects of a different kind of artificial fever, in this case created by a high-frequency circuit similar to a short-wave radio transmitter. Radio therapy got its start when short-wave experimenters noticed that they rarely caught cold and that they usually had high temperatures while operating their high-frequency sets. In radio fever machines six meters is used for "deep" heat and eighteen meters and twenty-four meters are used for inducing general high temperatures. Encouraging results are being obtained in treating high blood pressure, arthritis, for building up the circulation of limbs restrained by casts, and for other purposes. Some investigators think that occasionally the results are much better than could be expected from heat alone, suggesting that short radio waves may be found to have a special therapeutic value.

Electromagnetic energy in another wave length, ultraviolet light, is best known as the ingredient in sunshine that causes sunburn and tanning. Ultraviolet radiation is used to increase the vitamin content of milk and to sterilize the waters of swimming pools. Dentists use its fluorescent band to study the condition of teeth. Ultraviolet of the middle

(Continued to page 140A)



Launching "pickaback" composite plane at model aircraft meet in England. The carrier ship has a seven-foot wing spread

One miniature airplane rode "pickaback" on another in a recent model plane meet at Bournemouth, England. The "parent" ship had a wing spread of seven feet and was driven by a gasoline engine. The composite model was copied after the pickaback plane that passed its tests in a flight across the Atlantic ocean last year.

## Nested Cans Freeze Ice Cream C.F. and Cool Beverages

Nested aluminum cans form a heat-exchange unit for the kitchen, capable of freezing ice cream, cooling beverages and performing various other heating and cooling tasks. The inner can is fluted to provide the maximum cooling surface. To cool a drink, this fluted can is filled with ice or other refrigerant and placed inside a large can and the space between is filled with the beverage. Similarly, an ice-cream mixture can be placed in the larger can and the fluted one, filled with Dry Ice or salt and ice, used as a plunger to freeze the mixture.



Seamless, flexible metal tubing made by a Connecticut firm for handling steam, liquids and gases has been flexed 3,000,000 times without breaking.

*American Brass Co.*

*Patent Appraisal and Just Compensation*

*118 E 40th St. New York*



## Single-Wheel Farm Tractor Has Its Motor Inside

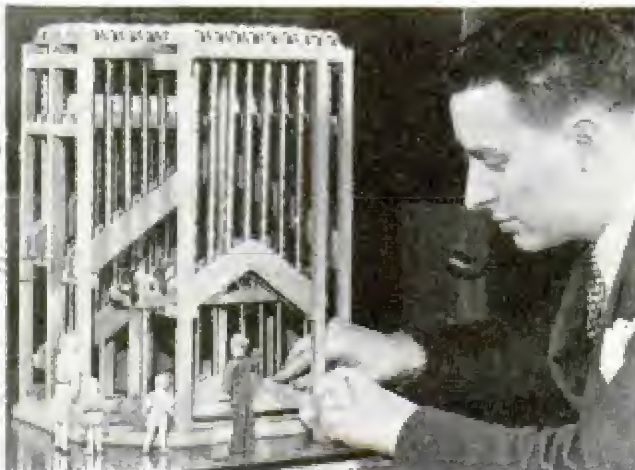


Inset shows how one and one-half horsepower engine is mounted in wheel of this many-purpose tractor

Having only one wheel with a one and one-half horsepower engine mounted at its center, a lightweight tractor eases much of the field work on a farm. By interchanging many small attachments, the 105-pound unit is made ready to plow, cultivate, mulch, dust crops, mow or sweep the lawn. It develops 3,600 revolutions per minute and a hand throttle permits variable speed control.

## Scale Model of "Singing Tower" Has Seventy-Five Bells

Miniature copy of the great carillon installed in the campanile of the memorial to Stephen Foster, famed song writer, a

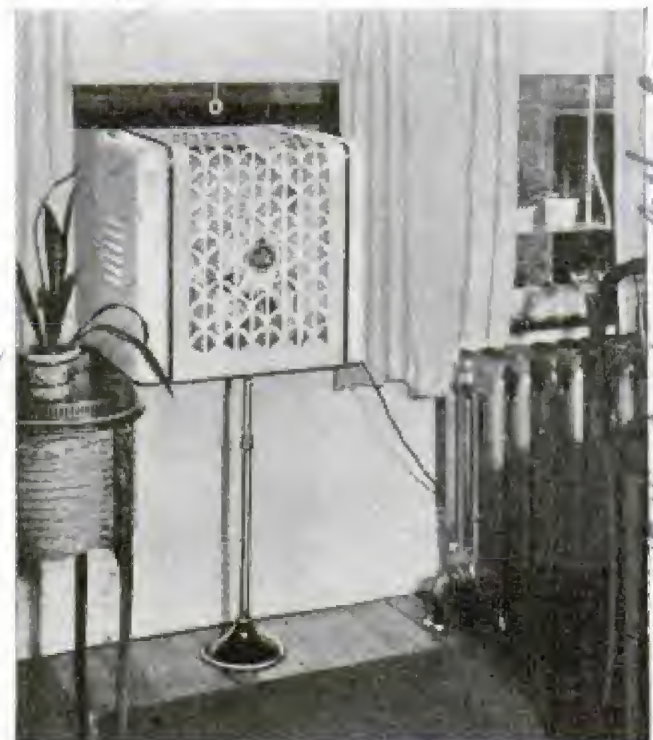


This tiny model of carillon in Stephen Foster "singing tower" will be placed in the memorial campanile

scale model has seventy-five bells of tubular construction. The model is on a scale of one inch to a foot. The original carillon in the "singing tower" is twenty-two feet high and weighs twenty-five tons. Its tubular bells are more than 600 feet in total length, required more than sixty miles of electrical wiring and can be played by manual or by an automatic player with rolls like those of the player piano. Eventually the model will be placed in the campanile of the Foster Memorial overlooking the Suwannee river.

## Fan on Window Sill Ventilates House with Outside Air

Inclosed in an attractive case to guard the blades, an electric fan is made for mounting on the window sill to ventilate



Window fan mounted in ornamental housing draws 4,000 cubic feet of fresh air per minute into house

a small home. It performs the same service as an attic fan, delivering 4,000 cubic feet of air per minute which is sufficient for a five-room house. Panels at the sides can be extended to fill window openings twenty-six to thirty-six inches wide. If the sill is too narrow to hold the fan, an adjustable floor support is available.

Send return postage to our Bureau of Information to learn the name of the maker of any device described in this magazine.



# Master Violinist Trains with Finger Twisters



The great violinist needs more than knowledge of music and mastery of strings. Iso Briselli, concert artist, considers flexible wrists and fingers, muscular strength and control equally important. You may see him on a streetcar endlessly twisting his fingers as shown above, one of his "setting-up" exercises



Above, Briselli with Stradivarius violin, which he values at \$50,000. He gives his finger and wrist muscles a strenuous workout with spring-grip iron dumbbells, left, which offer resistance as he exercises each finger in turn. Hours of this training equip him for the rigors of a performance



Simple "gymnastics" that can be performed anywhere comprise Briselli's methods. For example, he uses four ordinary corks to tone up the muscles all the way down to the wrist, working the corks up and down between the fingers. Above, another simple device—a rubber band twisted around fingers limbers and toughens muscles



## Radio Compass Keeps Point Toward Station Tuned



Arrow of automatic radio compass, shown at top in cockpit, points unerringly to station tuned in

Direction finding by radio compass is brought nearer perfection by a completely automatic compass just developed by the Sperry Gyroscope company and R. C. A. manufacturing company. Early types would line up the needle in the direction of a radio station but would not distinguish that direction from the exact opposite, and a confused pilot might make a 180-degree mistake and fly directly away from his destination. The new compass has an arrow which points unerringly to any station or radio marker beacon tuned in, and points constantly just as the magnetic compass

points to its pole. The indicator panel is seven inches square, mounted horizontally in the cockpit. It can distinguish between stations only three kilocycles apart in frequency, and is accurate within one degree in direction. The compass gives a definite indication when a plane passes over a marker beacon to whose signals the instrument is tuned, pointing straight ahead until directly above the beacon, then making a 180-degree swing to point directly back.

## 4,000 Makes of Cars on Sale Since First in 1868

More than 4,000 makes of automobiles have appeared since the first car propelled by an internal combustion engine was turned out in France in 1868. This estimate, by the Smithsonian Institution, is based on a list compiled by Frank Walker, a collector of auto name plates. This list shows approximately 3,200 different makes had been introduced up to 1909. During the great boom of 1905-1906, the purchaser had the choice of 700 varieties. Makers of bicycles, guns, sewing machines, telephones and typewriters began turning out cars and one manufacturer changed a bird-cage factory into an auto plant.

## Carbon Dioxide Covers Fire with Harmless Blanket

Too often the damage done by fire is exceeded by the damage wrought by water and chemicals poured on the blaze. In the hunt for a harmless fire-extinguishing



Smothering oil fire with carbon dioxide. This method proved most effective on indoor fires where wind was not a factor. The gas is harmless

Sperry Gyroscope Co. Inc. 100 Madison Ave. New York City

Washington, D.C.

9860

July 11, 1939

Ward World



*Tests conducted by Mr. S. H. D. nberg.*  
*Washington, D.C.*  
 agent, the Bureau of Standards recently tried carbon-dioxide gas with encouraging results. They wanted particularly to find an extinguisher which would not damage papers and furnishings in a room. Gasoline was set afire in a building slated for demolition, and carbon dioxide effectively snuffed out the blaze by depriving it of oxygen. Papers stacked on shelves in the room were unharmed by the gas. Carbon dioxide, however, did not prove so effective in outdoor tests. Because the gas was blown away by the wind, it failed to put out a gasoline blaze on a pool of water.

### Dial Tells Inside Diameters to Ten-Thousandth Inch

Accurate within less than one ten-thousandth of an inch, a gauge just introduced measures the inside or outside diameters of small objects or holes. The measurement, appearing on a needle dial, shows out-of-roundness, size, taper and bell mouth. Three basic methods of measurement are possible by means of control knobs on the front.



Needle dial gives instantly the inside or outside diameter of small objects within 1/10,000 inch

### Blower of Giant Soap Bubbles Builds Puppets to Mimic Him



One of Mr. Warham's biggest bubbles and his troupe of twelve marionettes which dip pipes and blow bubbles mechanically

Himself a renowned blower of bubbles, Robert F. Warham of Piedmont, Calif., has passed on his art to a troupe of tiny puppets. Operated mechanically, the twelve marionettes periodically dip their pipes into cups of soapsuds and then blow. Mr. Warham has made a hobby of bubbles for twenty years and under favorable atmospheric conditions has blown one nine feet in circumference.

### Oil Burner with Whirling Flame Burns Clean and Saves Fuel

Burning with a continuous, whirling flame that induces thorough combustion, an oil burner just developed provides an even heat and economical use of fuel. The oil is accurately metered by a carburetion principle. The flame is constant except for emergency shutoffs, and is controlled by a room thermostat, burning high or low as demanded but always with a rapidly spinning vaporized flame. A tangential air inlet produces this rotary flame. The only moving part is the blower wheel.

*Federal Product Corp.*

*Bennett Mfg. Co.*

*Minneapolis, Minn.*



## Twin Gauge for Car Wheel Shows if Repair Is Needed



Checking wheel with gauge which helps show cause of uneven tire wear, shimmy and similar troubles

To check both the camber and caster of front automobile wheels—that is, the slant of the kingpins and wheels from the vertical—a single tool recently placed on the market shows the measurements on an easily read scale. This helps the repairman to determine the cause of uneven tire wear, shimmy, bad steering and other troubles at the front end of the car. The twin gauge is made of aluminum.

## "Safest" Office Has Traffic Lanes and Fireproof Glass Pitchers

Divided lanes on the floor and "fireproof" water pitchers are features of the safety program in the office of the National Safety Council at Chicago. It is one of the safest places to work, for an organization devoted to accident prevention must practice what it preaches. A yellow center line was painted on the floor around a "blind" corner of the corridor to separate "traffic" and prevent head-on collisions of employees. To promote good health, each desk has its own glass and water pitcher, re-

filled several times a day by an employee who does nothing else. Oddly enough, the ordinary glass pitchers originally used were the cause of several small fires. The sun's rays focused through the pitchers set fire to papers and blotters on desks, and after two or three such occurrences frosted-glass pitchers were substituted. A medical examiner and full-time nurse watch over employees' health. On hot days employees are given three or four tablets, seventy per cent salt and thirty per cent dextrose, to avoid heat exhaustion. Each room has a portable humidifier for use in winter months, and the nurse reported all complaints of nasal irritations and dry-air discomfort ended when these were installed. Posture chairs are specially adjusted to fit the back of each employee. Short-wave diathermy machines, first-aid services, medical examinations and sun lamp are available at all times, and as a result of the general safety and health program the office, with 131 employees, had the low employee absence record of one and nine-tenths days per person for the year 1938.

## Color Film Placed in Lamp Shade Shown by Diffused Light

Photographs, both the color transparencies and black-and-white variety, take on a more lifelike appearance and add a decorative note to the room when framed in a lamp shade manufactured for that purpose. Diffused light from the lamp effectively brings out all the details, particularly of color pictures.



Photographic transparency, either colored or black-and-white, enhances attractiveness of lamp shade



## Arc-Welding 'Surgeons' Save Mill Shutdown

Six arc welders, working side by side like a group of surgeons, performed a major operation on a steel-mill casting, restoring the mill to service in eight hours. Without electric arc welding, the mill would have been closed several weeks awaiting a new piece. The trouble was caused by breakage of the pusher head of a scale breaker used to remove slag. Four hundred pounds of arc-welding electrodes were melted into the casting to repair the fracture.



Working like a team of surgeons over a hospital operating table, six electric-arc welders melt 400 pounds of electrodes in repairing a casting

## Old Boxcar Rides as a Trailer to New Job on the Farm



Fitted with temporary wheels, a freight car becomes a trailer on its way to retirement as grain shed on a Kansas farm

When a boxcar is retired from railroad service in Kansas, there is a chance it will make its last trip as a trailer to some farm where it will continue its useful life as a granary. This means of hauling the cumbersome vehicle was adopted by a mover who equips the freight car temporarily with large rubber-tired wheels, which he has designed and built especially for the purpose, and hitches it to the back of his truck-tractor for its last ride.

## Powerful Vacuum Cup Pulls Out Soft Dents in Body of Automobile

Soft dents in automobile bodies can be pulled out with a vacuum cup equipped with a powerful grip. Rather than take the time and expense of tearing out upholstery to pound the dent straight from inside, the rubber cup is moistened and applied to the "dimple" with pressure; then the locking lever is snapped down, increasing the grip. The tool is useful for removing hub caps and for similar garage jobs.

More people are killed in farm work than in any one industry, the farm accident toll reaching 4,300 in 1938 out of a total of 16,500 industrial deaths.



Straightening out a dimple in side of car by applying vacuum cup and pulling it out

Washburn Safety

Urethane Metal Products Co.  
2649  
P.O. Box 100  
Cleveland, Ohio



# WONDERS



comes next. Steam is forced into the double bottom to kill any petroleum gas that remains, fires under the boilers are shut down, and the ship becomes inert.

When a big ship is due in for repairs or even for routine cleaning and inspection at the San Pedro, Calif., yard of the Bethlehem Steel company, the floating dry dock is sunk into place, the ship is floated into position above it, and the docking master begins raising the dock and ship on an even keel. Keeping an eye on a plumb line suspended



**R**ESULT of a collision at sea the night before, the big freighter had a gash in her side extending from the shelter deck down to the turn of the bilge. Her sturdy steel plates were crumpled like cardboard and waves swirled in and out of the open wound. Strong watertight bulkheads were keeping her afloat until she could get to the hospital.

Along the water front of every large port you will find a hospital for ships. On its staff are diagnosticians, skin and bone specialists and surgeons. Its operating room is the dry dock and its surgical tools are giant cranes and riveting hammers.

Ships are delicate, complex structures and if the lower part of a hull has been damaged in a wreck the first step in the hospital is to "bleed" the patient by pumping out the oil stored in the double bottom. Otherwise it would drain away as the ship is raised. Administering the "ether"

Top, erecting scaffolding around rudder so welders may make minor repairs. Bottom, ship severely damaged in collision reaches the "hospital"

*Bethlehem Steel Co*  
*San Pedro*

*Cink Thomas & Son, 10555 Hollywood Ave, Los Angeles, Calif*

*more*



2596  
OF

# SHIP SURGERY

from the ship's bow, he uses a megaphone, whistle, and signal boards to notify pumpmen along each side of the dock of the speed at which each is to discharge water from the buoyancy compartments. Previously he had superintended the fastening of keel and bilge blocks to the dock's deck, laying them in a pattern that would safely cradle the ship. As the dock rises from the water it lifts the ship with it, raising it slowly so that the hull may be scrubbed clean by gangs working from punts moored alongside.

A ship that has been salvaged from the rocks or damaged in collision gets a scrupulous examination. Steamboat inspectors, insurance underwriters, and owners'



Bottom, left, thirty-five feet of damaged bow removed from ship shown on page opposite. Bottom, right, repair completed in Bethlehem Steel company's yard. Top, docking master signaling pumpmen as dock rises with ship





grass and barnacles may attach themselves to a hull between inspection periods. Such growths slow down the ship's speed and it is cheaper to trim them off than it is to drag them through the water. Marine parasites grow fastest on ships traveling in the tropics and they flourish when ships are laid up for long periods in still water. Occasionally shipyard men find that an oyster bed has started to grow on a hull. Now and then live fish that have been feeding on the growths refuse to leave and are found as water in the dry dock recedes.

Most marine paints contain large amounts of poison that slow down such growths. A trip through the Panama Canal, into the Great Lakes or up any fresh-water stream kills the salt-water growths. Electrolytic corrosion is a queer disease that attacks metal ships and the metal fit-

representatives diagnose the damage and recommend treatment. Damaged plates and rivets are burned off with acetylene torches. Bulkheads not too badly bent may be heated up and strongbacked into place. Stanchions and frames are removed for repairs or replacement. New shell plates that may weigh two tons each and require 1,000 rivets for fastening into place are molded to the ship's contours, and installed.

Ordinarily internal injuries, such as damage to engines or leakage or stoppage of pipe lines, can be repaired while the ship lies alongside a wharf. When a sea valve has to be repaired or the propeller shaft needs treatment the ship goes into dry dock. Grave injuries to a ship are rare and much of the work of the marine hospitals consists of keeping healthy ships in good condition. Vessels are lifted out of the water every six months or so to make certain no trouble is developing. The condition of the plates, the condition of the propeller and rudder fittings are all studied. Sea valves are cleaned out and the wearing of the shafts and stern tubes is measured. Often a vessel that has been at sea for a long time has a few loose rivets that must be tightened or replaced.

When a ship is docked merely for inspection and cleaning the shipyard workers call the job a "haircut and shave" and that's exactly what it amounts to, on a vast scale. As much as seventy or eighty tons of sea

cedes. Most marine paints contain large amounts of poison that slow down such growths. A trip through the Panama Canal, into the Great Lakes or up any fresh-water stream kills the salt-water growths. Electrolytic corrosion is a queer disease that attacks metal ships and the metal fit-

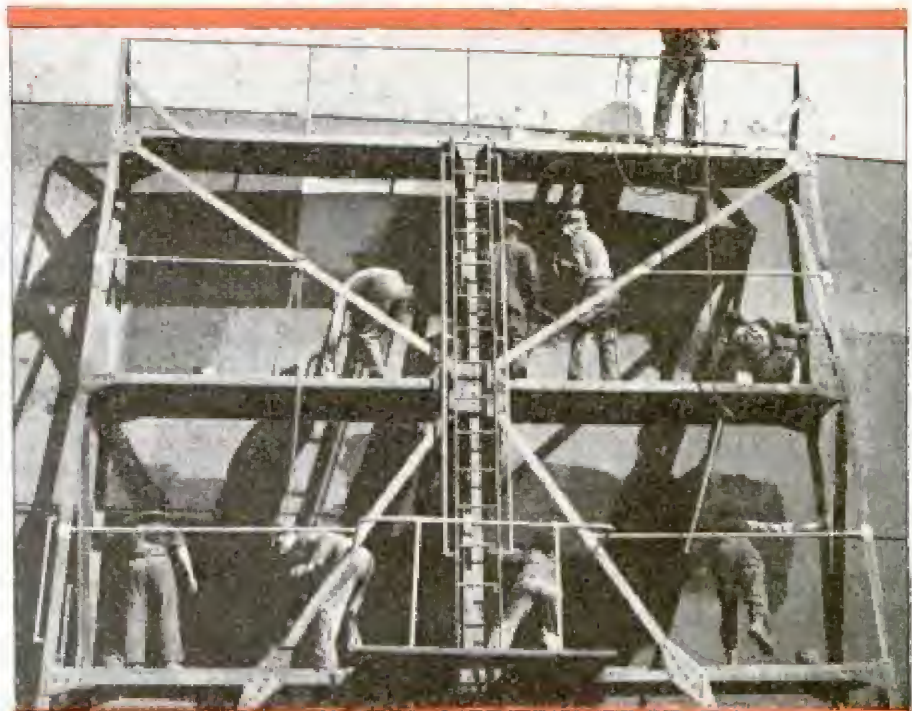


Top, painters with long-handled brushes apply new paint at water line of vessel. Bottom, numbers on damaged ship indicate plates that must be replaced

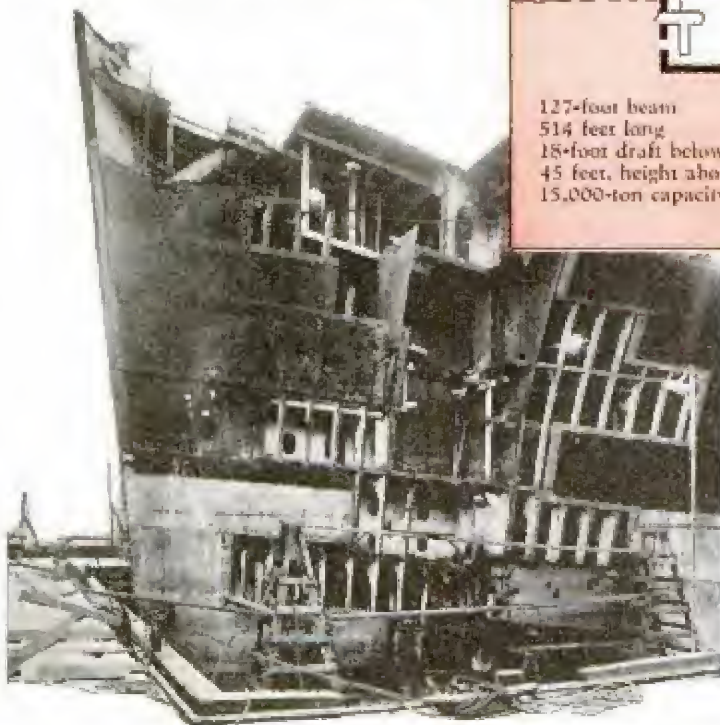
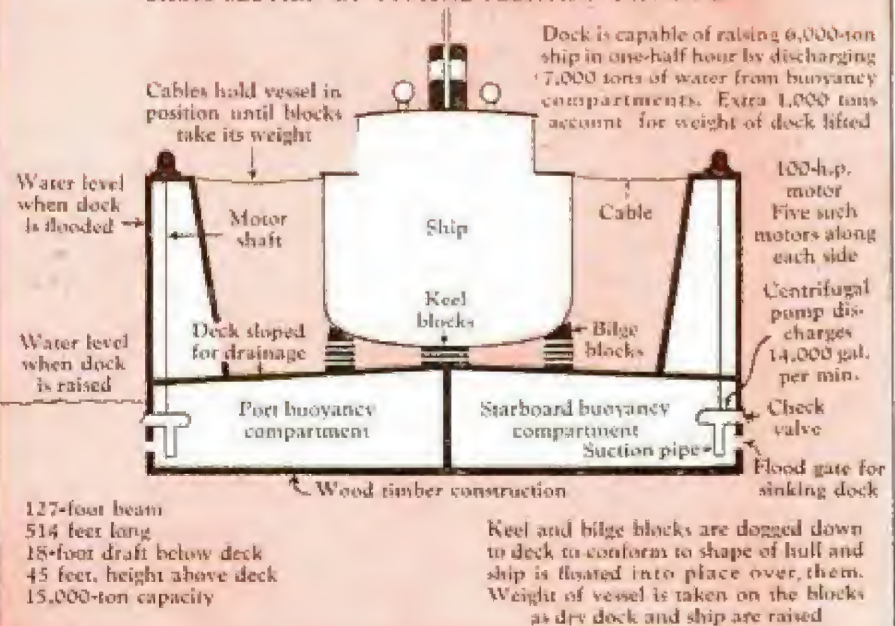


tings of wooden ones. Even in fresh water the ship acts as a battery and rapid corrosion and pitting occur in the underwater metallic parts that serve as the negative pole in the circuit. Grounding of electric cables to the hull increases the action, and in some cases the electrolysis is strongly localized to small areas, threatening the strength of the hull at such points.

One way of fighting the disease is to fasten small zinc plates to the hull, zinc being such a perfect cathode material that the plates are eaten away and the rest of the hull is not attacked. The plates are renewed when the ship is docked for cleaning. A special metallic paint is sometimes used for the same purpose, and another way to combat the action is to install an electrolysis eliminator that reverses the normal po-



#### CROSS SECTION OF TYPICAL FLOATING DRY DOCK



Top, at work on side of ship. Center, cross-section of dry dock. Bottom, vessel in the process of being restored to seaworthy condition

larity of the structure for periods of time.

One interesting job in a shipyard is rejuvenation of an obsolete vessel that has been lying in dead storage. Many ships that have grown old and out of date in service are operated upon to restore them to useful lives. Large freighters are sometimes converted into passenger ships when the need arises. A more frequent facelift operation is the work done on a passenger vessel built for service in cold latitudes when it is shifted to a permanent tropical run. Roomier quarters and better ventilation are needed in warm waters. Three large American liners recently shift-

(Continued to page 122A)



## Rolling Garden "Dustpan" Tilts to Pick up Refuse

*Isard. N. Carl*



Rubber-tired metal cart for lawn work tilts forward to pick up a load from the rake

Grass cuttings and refuse are raked from the lawn or garden into a V-shaped cart, like dirt is picked up by a dustpan. Pushed or pulled like a wagon, the two-wheel vehicle is filled by tilting it forward so the front edge lies flat on the ground, and it is emptied as easily.

## Ready-Sliced Bread Cut Thinner by Using Safety Holder

Soft bakery-sliced bread can be re-sliced without tearing or crushing if you have a metal holder that grips the slice firmly and also protects the hands. Ordinarily bread

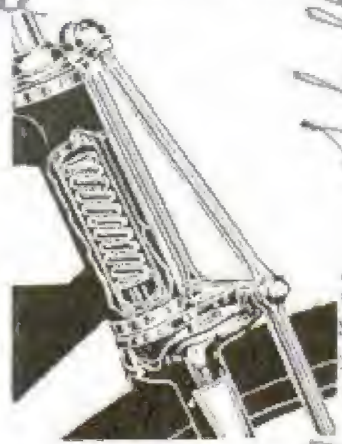


To cut bread thinner for melba toast or sandwiches, put slice in this metal holder and slice it again

comes from the bakery in half-inch slices, but these are too thick for party sandwiches, melba toast and canapes. The slicer holds the bread between two hinged plates which are perforated and have sharp protruding prongs on the inside. The knife is guided in a slot between the plates.

## Bicycle Fork with Built-In Spring Cushions Front Wheel Shocks

Spring suspension for the front fork of bicycles, inclosed in the frame head, absorbs road shocks without permitting side play or wobbling of the wheel and without weakening the fork. Out of sight



where it is protected from the weather and safe from juvenile tampering, the combination spring and rubber mounting is simple and rugged in construction and requires no servicing.

## Auto Wax Applied by Spray Gun Used as Cap of Container



Closeup of spray gun as applied to furniture and automobile cleaner and wax container

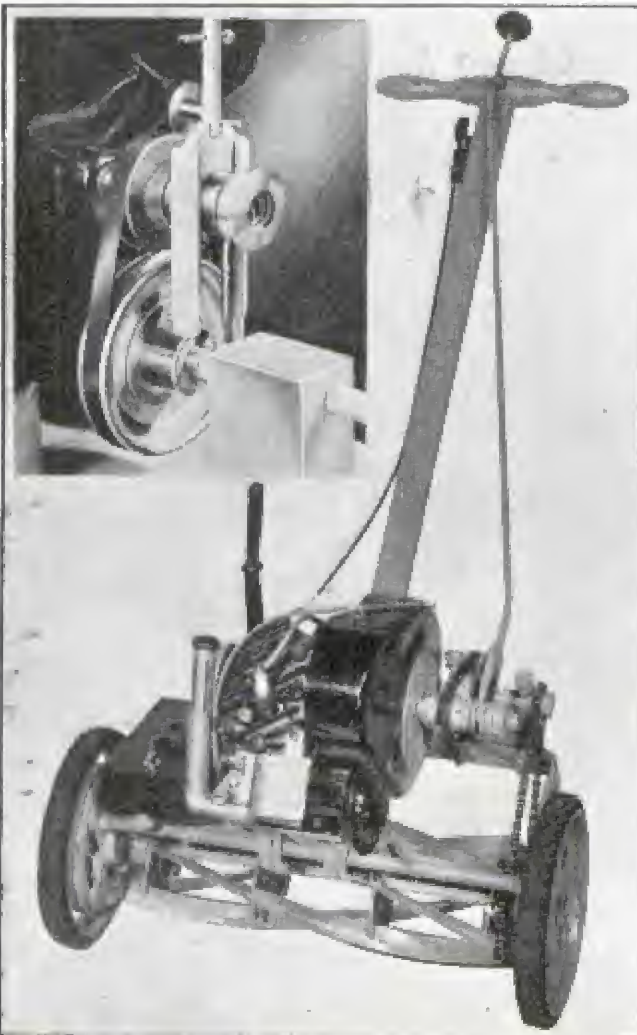
Applying a cleaner-and-wax liquid on automobiles by means of a small spray gun results in faster work and in a saving of the liquid, as compared to the standard



application with a cloth. This method is being introduced by a manufacturer of colored auto waxes and furniture cleaning fluid. The spray gun, which is operated by hand, screws on the liquid container, replacing the standard top. Pressing the spray-gun plunger with the thumb several times starts the fluid to begin spraying over either auto or furniture surface.

### Simple Clutch with V-Belt Drive Idles without Friction

Smooth transmission of driving power, frictionless idling and finger-tip control are offered by a V-belt clutch designed for use with the smaller type engines on in-board motorboats, power lawn mowers, farm implements, light industrial machinery, midget racing cars and scooters. It provides a means of delivering power to the driven shaft at any desired speed or ratio, eliminating the need for transmissions or extra pulleys and gears.



Power lawn mower with V-belt clutch installed, the inset showing installation on small in-board motor

### Red-Hot Glass Survives Dip in Bowl of Ice Water



Top, note shrinkage of heat-resistant glass; below, torch fails to crack glass resting on ice cake

Glass made by a new process resists cracking or breaking under sudden temperature changes because of its low coefficient of expansion. You can heat it to cherry red and plunge it into ice water without fear of breakage. It will be two years before products of the new glass can be offered to the public. At one point in the process articles shrink weirdly to less than two-thirds their original volume, but without changing form or becoming distorted. In making a dish, it is molded in the usual way with a special kind of glass. Then, through a series of treatments involving a final step of leaching with dilute nitric acid, part of the structure of the glass is removed. At this stage it is full of sub-microscopic air spaces and feels rough to the touch. A final heat treatment to release this air reduces the body to a clear, solid mass, about ninety-six per cent pure silica. It is here the shrinkage occurs.

Corning Products Co.

g 724  
Corning Glass Works, Corning, N.Y.  
Developed by H.B. Ford and  
under development



## Knitted Seat Covers for Car Slip on Like Sweater



Washable seat covers of knitted material cling smoothly like a sweater, needing no fasteners

Automobile seat slip covers made of knitted material, and having elastics to help them cling snugly like a tight-fitting sweater, need no fasteners or tacks to hold them in place. It takes only a few minutes to put them on or remove them.

## Balloon "Tires" on Car Bumper Silence and Soften Jolts

Miniature balloon tires mounted on automobile bumpers take the shock out of the bumps of stop-and-go traffic and curb



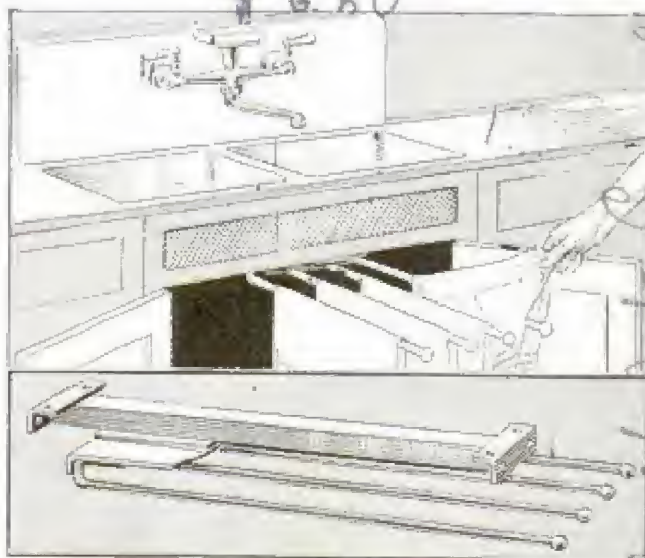
Small balloon tires of rubber without fabric, carrying eight pounds of air, cushion bumps in parking

parking. As recently devised they are ten by four inches and carry eight pounds of air pressure, being made of rubber without fabric. A cushioning action without noise is the result when bumpers meet.

## Pilot Is "Talked" Down Safely by Blind-Landing Beams

Out of the air comes a voice repeating "Left . . . left . . . left," guiding the pilot down to earth through the fog. It is the voice of a blind-landing system which actually talks the flier to the airport runway through four cigar-shaped radio beams. These beams, directed from the landing field, form a funnel into which the plane glides. If he is headed right, the pilot hears only a buzz. If he is too far to the right, the voice calls steadily "left . . . left;" above the glide path the pilot hears "down . . . down," and so on. While light signals in the cockpit could substitute for the voice, audible signals are preferred by the inventor so that the flier's eyes may be free to watch for the ground.

## Towels on Disappearing Rack Slide In and Out of Cabinet



Parallel bars of chrome for hanging towels fold away into small space under sink or in cabinet

Towels are kept out of sight when not in use by a set of four parallel bars that slip into the cabinet at a touch, and reappear by a similar operation. A space twenty by eight inches is required for installing it in the bathroom, kitchen or personal cabinet. Rods are polished chrome.



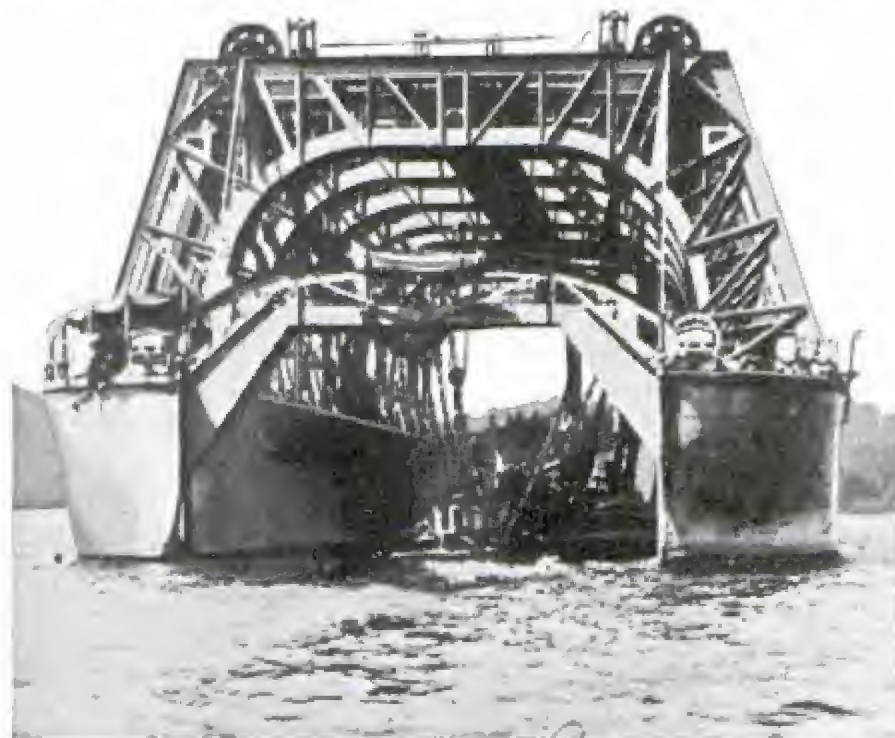
## Four-Ton Lens Casts Light Beam 24 Miles

Electricity has taken the place of oil in the lamp of the lighthouse at Point Reyes, Calif., and as a result a beam is now thrown twenty-four miles out to sea. This was made possible by completion of a ten and one-half mile power line, supplying current for a 1,500-watt lamp having a candlepower of 500,000, nearly five times that of the old lamp. The latter, consisting of an oil-vapor mantle, gave off smoke that caused clouding and necessitated constant polishing. The Point Reyes lighthouse lens, installed sixty-nine years ago, weighs about four tons and contains more than 1,000 prisms of special glass. Set in the center of this rotating lens, the light is greatly intensified, and the prism arrangement spreads out a fan-shaped beam over one of the most dangerous headlands known to mariners.

*Fifteen-hundred watt electric lamp has just supplanted oil in the old lighthouse at Point Reyes, Calif.*



## Floating Bridge Goes to Rescue of Sunken Submarines



*This French rescue ship met its first practice test by lifting to the surface a submarine deliberately sunk in ocean near Toulon*

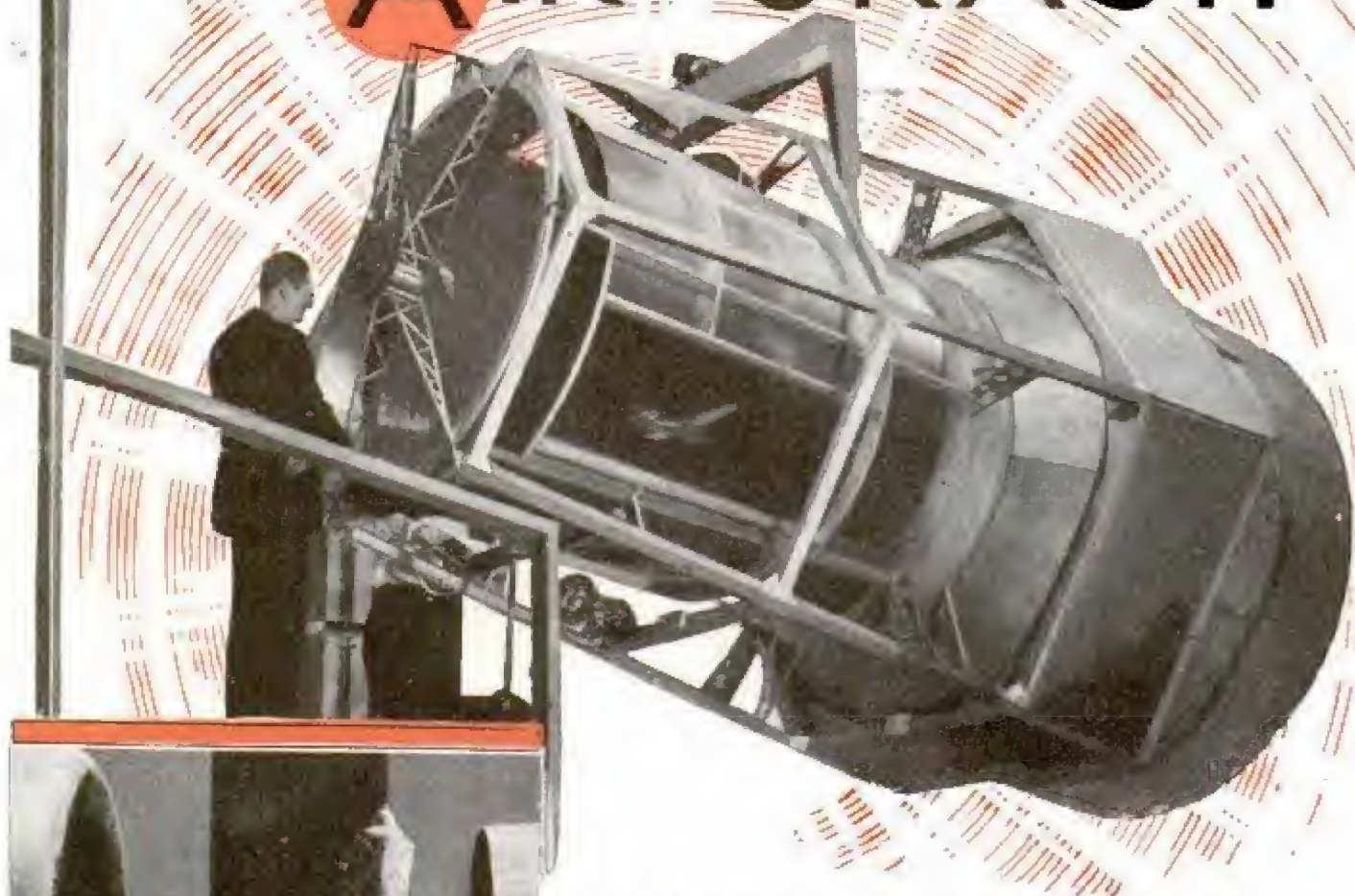
France has built a huge floating bridge as a rescue ship for sunken submarines, and, although never tested in actual disaster service, it has proved its worth in practice. The two vast pontoons support a steel superstructure carrying the chains and rigging for lifting a submarine from the bottom. A submarine was deliberately sunk, and after chains were attached the bridge raised the ship.

¶The 29,485,680 motor vehicles registered in the United States in 1938 traveled 250 billion miles during the year.

*National Safety Council*



# AIR-CRASH



*Above, N. A. C. A. tunnel in which model plane flies freely, permitting new method of studying stability and control characteristics. Left and bottom, making tests with glucose coating to find its effect on delaying ice formation*



WITH only two passengers aboard, Trip 1 taxis to the end of the runway in the darkness of a wintry night. Twin motors roar, and the air liner thunders across the field, then slowly rises.

Five hundred feet up, and the pilot turns. Routine stuff, this is, to a man with 12,000 hours of flying time, years on this route.

Then something happens. A whiff of smoke, a sudden blast of heat on his leg. He glances down. Around the edges of the emergency control box cover forming part of the flooring between him and the co-pilot, tongues of flame are licking.

Snatching the fire extinguisher, the co-pilot rips up the cover. Instantly the cockpit is a roaring inferno of blazing gasoline; gasoline from a leaking cross-feed valve.

Both pilots throw up hands to protect their faces from the heat; and the plane dives for the ground. Clothing on fire, writhing in agony, the pilot grabs at the control column, pulls it back just in time to prevent a crash, climbs sharply.



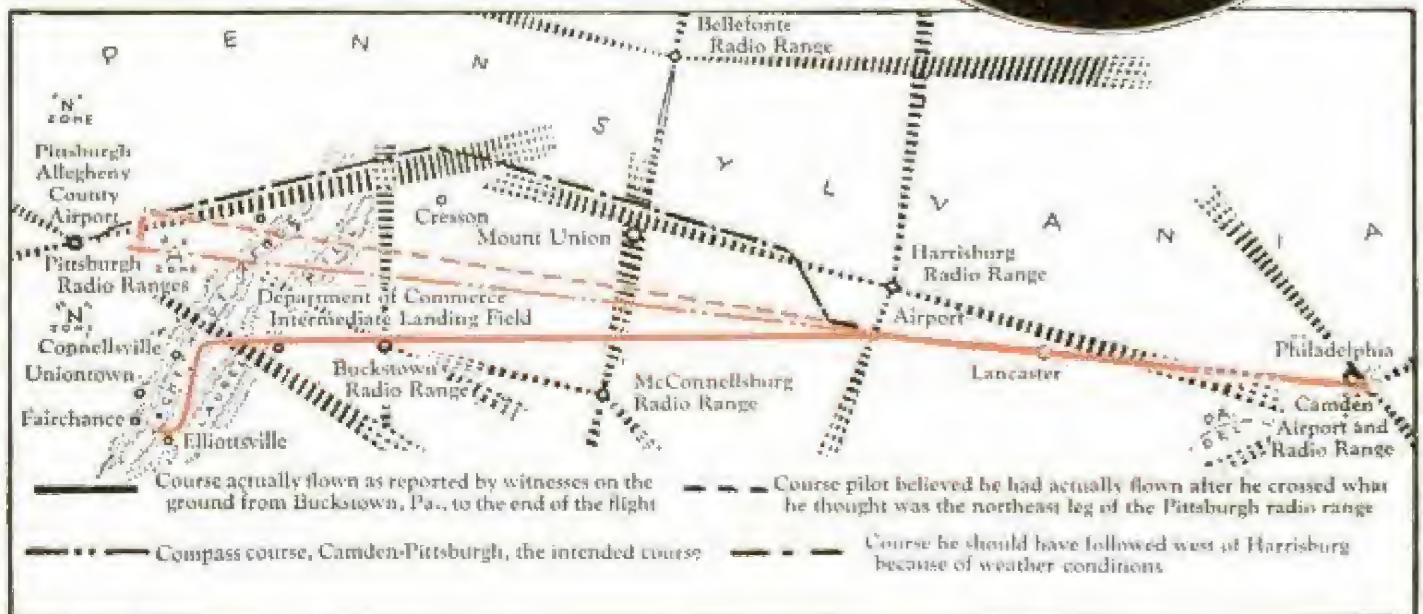
# DETECTIVES



Above, "eyebrows" on wing edge give better control of plane. Circle, Thiokol-lined fuel tank after twenty-foot drop. The lining did not fail. Bottom, drawing is government's explanation of how pilot mistook southeast leg for the northeast leg of radio range, descended to land and crashed into mountain

Then a whiff of that flame and a dead man sits at the controls. A wing drops, and the air liner plunges into a ravine, scatters its fragments along a hundred yards, only half a mile from the airport. The wreckage is destroyed by fire, and all aboard are killed.

A few years ago this would have been another mystery crash. Today, although we have no survivors to tell what went on



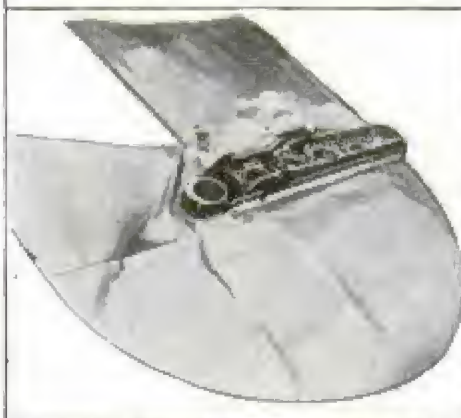




during those few desperate seconds, we know exactly what happened.

Today we have the crash detective. Officially he's an investigator for the Air Safety Board of the Civil Aeronautics Authority. His job is to run down clues, solve mysteries, save lives.

There weren't many clues when the investigators arrived at the crash scene. Delayed nearly two days by a severe storm, they found the ravine trampled by sightseers and souvenir hunters. But buried in dry grass and brush, not far from the first point of impact, the investigators found a little wooden box lid, aluminum bound and covered with rubber matting. It was the cover of the emergency control box which contained the cross-feed valve, dump-valve controls, flare releases, a key for turning the valves, and an electric light to illuminate the box. The cover was hinged on the rear, and contact of a metal strip



*Top, test to determine fire hazard from dumping gasoline. Next, cover of emergency control box. Note deep burn in corner, which was directly over cross-feed valve where fire started in plane. Third from top, remains of tail assembly helped tell story of another crash. Bottom, 200 DH-4s were crashed before fire hazard was eliminated*

switched on the light when the lid was raised.

This meager clue, hurled clear of the fire area and miraculously concealed from souvenir hunters, told the whole story. A concentrated burn, directly over the cross-feed valve, showed that the fire had started here, had played upon the spot with blowtorch intensity for nearly two minutes before the cover was opened. That it was opened before impact was evident from the direction of the charring on the under side of the cover, by soot on the contact strip, and by the manner in which the hinged edge had been ripped loose. Testimony of an airport attendant as to the sudden dive and climb preceding the crash, revealed the story of the pilot's dying efforts to avert the tragedy.

Thanks to the Air Safety Board, exactly that kind of an accident can never happen again. For that type of plane was





immediately grounded until the cross-feed system had been relocated; and regulations were passed making it mandatory that all planes flown in the United States must be provided with drainage outside the fuselage for any gasoline leak that might occur.

All aviation accidents, no matter how trivial, are



*Navy's new trainer (top) compared to vicious-spinning ship (center) on which stabilizer flush with top of fuselage blanketed rudder action in a spin. Bottom, Air Safety Board investigators searching for clues in plane wreckage*

immediately investigated by the Air Safety Board, or by military and naval boards in the case of service planes. The object is not merely to place the blame, but to eliminate the causes of accidents. Accident causes are analyzed by the National Advisory Committee for Aeronautics, as a basis for the research it continually conducts. Practically every safety improvement in American aviation has been the direct result of accident investigation.

The old DH-4, "flaming coffin" of the World War and the years immediately following,

(Continued to page 144A)



## Contour Meter for the Head Helps in Styling Hairdress



Studying contours of face behind triangle and circles, hairdresser determines most becoming "hairdo"

One New York hair stylist uses a "contour meter" to help in planning the best hairdress for his patrons. Its concentric circles and superimposed triangle enable the hairdresser to study the shape of the head and determine how the contour should be built up or narrowed by adjustment of the hair.

## Cubic Inch of Newly Found Star Weighs 18,000,000 Pounds

So heavy is the newly discovered star "Wolf 457" that one cubic inch of its mat-

ter weighs nearly 18,000,000 pounds. It is one of the two "white dwarf" stars discovered by Dr. G. P. Kuiper through the new eighty-two-inch telescope of McDonald Observatory in Texas. Half a billion times as dense as water, this star's matter is too heavy to be supported by any substance on our earth and would drop through it like lead through water.

## Drain Cleaner Given More Power by Enlarging Ball

Ten times the usual power is claimed for a drain force pump designed with a larger bulb to give additional pressure. By creating greater air compression against the water, and alternating with a more forceful suction, the most firmly lodged obstructions are removed easily.



## Upside-Down Dripless Server Pours Sirup from Bottom

Honey and sirups are poured through a spout at the bottom of a server that seals



Sirup pours out base when thumb lever is pressed; dripless server rests in base when not in use

Flood Dispenser Co.

Science Service

7/11/29

G.P. Zerk, 507. 5th Ave. New York

Our force pump is N. Wells

and fishes Williams Wis

Super Force Drain Pump Co. 620 N. Washington, Chicago



itself and prevents dripping on the table. A spring-tensioned thumb lever on the handle is pressed to lift the plunger that seals the opening in the bottom, and at the same time an air vent at the top opens to permit a free flow. When the lever is released a strong spring forces the plunger downward into the aperture, stopping the flow without the customary dripping. The unit consists of two parts, the server itself and a bowl-like base in which it rests when not in use. It is made of glass, chrome-plated metal, and molded plastic.

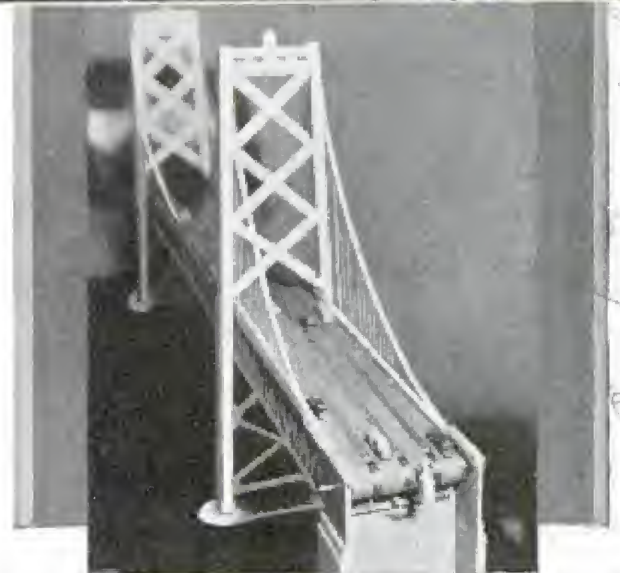
### Welded Steel Bench for Lathe Provides a Rigid Support

Streamlining is put to a practical use in a steel bench for lathe work, for its curved supports and rounded corners are designed for vibrationless, scientific bracing and elimination of sharp corners that are a hazard to the workman and form a pocket for dirt and chips. The bench is entirely metal and has welded joints, lacking any bolts or other fastenings that could come loose with vibration. Around the top is a deep rolled rim serving as chip pan and oil pan. The front is open like a desk to permit a comfortable position for the operator whether standing or sitting.



Vibrationless bench is achieved by curved supports and scientific bracing. All joints are welded

### Tiny Cars on Bridge Model Moved by Endless Belt



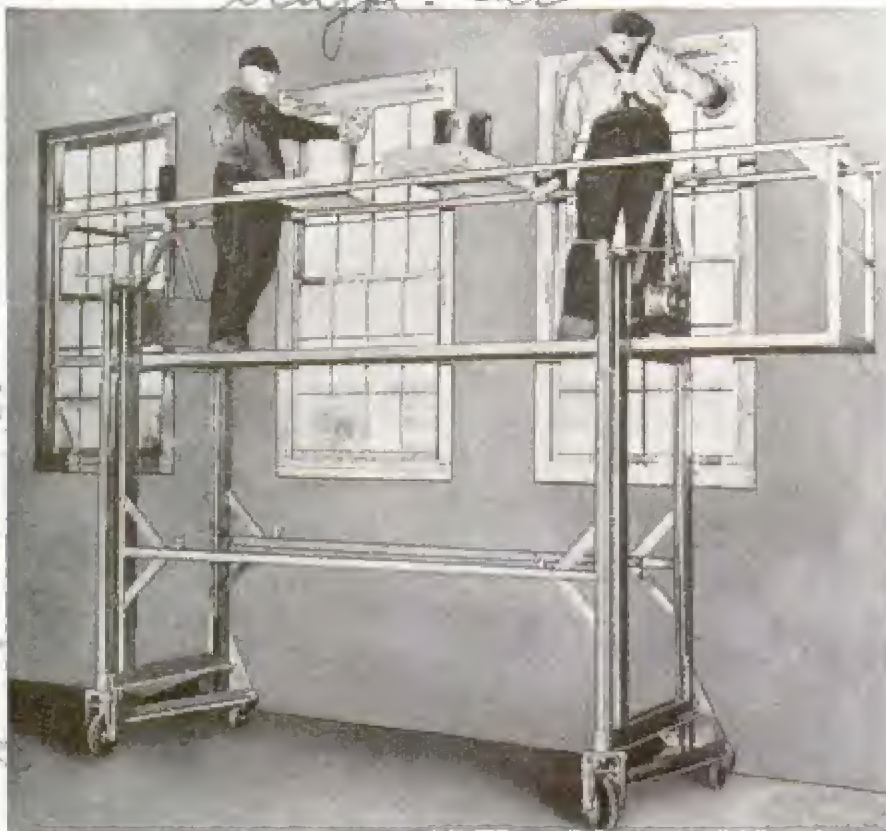
Four lanes of traffic keep in motion on five-foot model of bridge, cars being fastened to moving belts

Miniature automobiles traveling in a continuous stream along the traffic lanes add a bit of life and reality to a five-foot model of the suspension span section of the San Francisco Bay bridge recently completed by Peter Bodholt of Oakland, Calif. There are four lines of traffic, two moving one way and two the other, and to imitate actual conditions the inner high-speed lanes move faster than those on the outside. Four endless conveyor belts, each three-fourths of an inch wide, to which the midget cars are attached, cross the bridge and pass over the driving pulleys, where they are turned under and travel back between the upper and lower decks. A one-thirtieth horsepower motor from an electric adding machine furnishes the power. Round leather belts turn the pulleys which are of different diameters to give two speeds to the traffic lanes.

South Coast Lathe Works  
435 E. Grand St. Los Angeles, Cal.



## Self-Elevating Rolling Scaffold Maneuvered by Hand Cranks



Window washers or painters can not only adjust height of scaffold and move it along floor by turning cranks, but its length is also adjustable

Operated by workmen standing on the platform, a scaffold on wheels can be raised, lowered or moved about the floor simply by turning cranks. The standard model may be lifted from eighteen and one-half inches, its lowest level, to nine and one-third feet. In addition the length is adjustable and may be varied from five to ten feet. Railing on the sides guards the workers. The apparatus will carry 1,500 pounds. It may be used for overhead work of all kinds, and occupies only sixteen square feet when collapsed.

## Immersion Heater in a Bucket Plugs in to Warm Water



The familiar galvanized iron pail now is making its debut as an electric water heater. At the bottom of the standard fourteen-quart pail is a 1,250-watt immersion heating element which con-

nects with a plug on a ten-foot cord, convenient for a variety of uses on the farm, in the home and shop. A safety control disengages the plug when the water boils low, preventing damage from boiling dry. On the farm the pail is used for preparing heated foods for stock and poultry, for disinfecting jobs and for washing garments too soiled to be mixed with the family wash.

## Small Electric Cutter Has a Built-In Floodlight

Easily guided by hand, a portable electric cutting tool is equipped with a light to help follow the outlines on cardboard, stencil board, paper, celluloid or cork in making designs, stencils and lettering for signs and advertisements. The small machine is operated forward, backward or side-wise over the lines which have been traced, drawn or pasted on the material. Figures from three-eighths inch to two feet in height can be cut out.

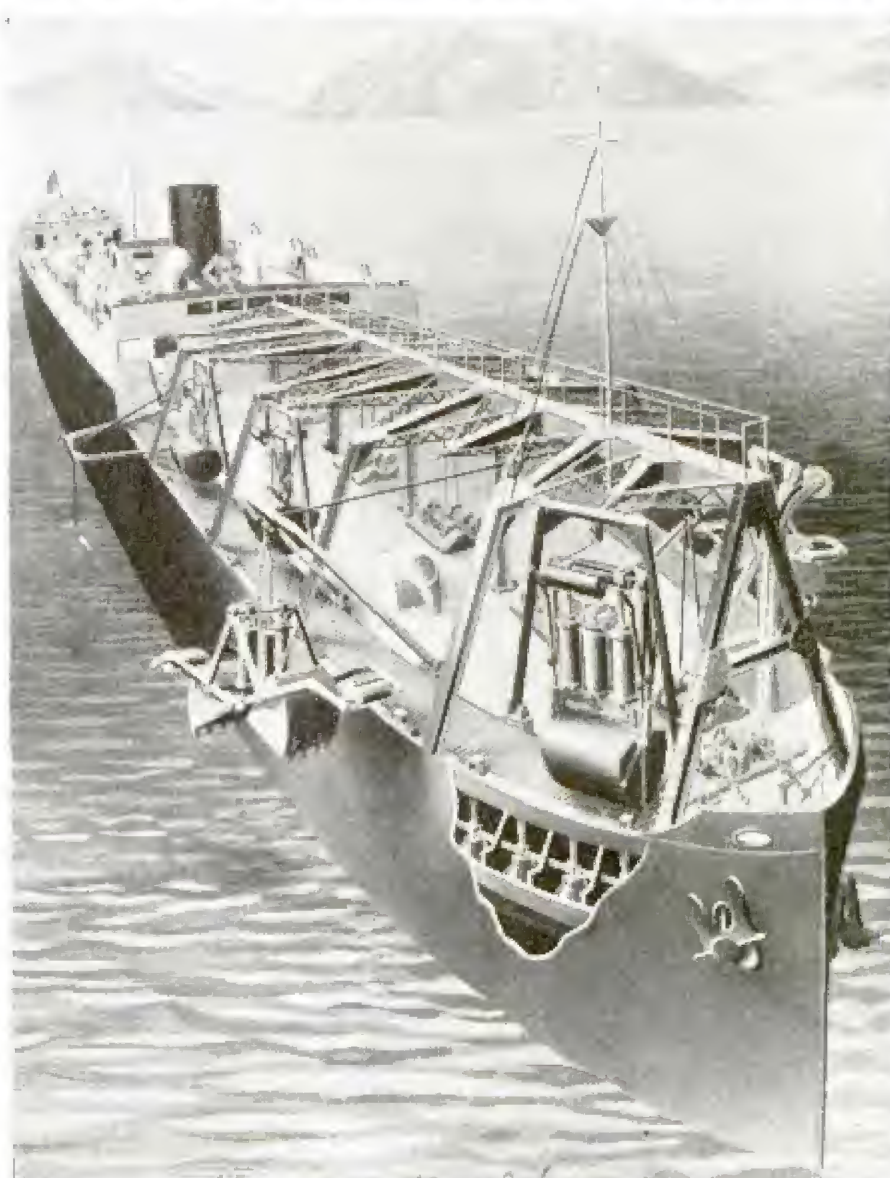


Spotlight mounted on flexible arm illuminates work while cutter is guided along pattern



# Giant Dredge to Dig for Gold 3,000 Feet Deep

Capable of bringing up gold-bearing mud from 3,000 feet below the surface of the ocean, a 9,000-ton self-propelled dredging unit is being constructed. Devices to be used in the digger have, in recent tests, reached depths of 1,000 feet under water, hitherto unattainable. The scene of operations for gold mining as now scheduled is in the vicinity of Stephens Passage, between the mainland of Alaska and Admiralty island in the heart of the Juneau gold belt, and in the area covered by the notation "gold dust" on charts of the United States Coast and Geodetic Survey.



Being built for a treasure hunt in the ocean floor, the 9,000-ton dredge at right is to dig for gold 3,000 feet under the sea near Alaska. Its equipment has proven practical in tests at 1,000-foot depth

## Field Gun Fires 100-Pound Shell over Fifteen-Mile Range

Most formidable field weapon of the United States army is the new mobile gun

that hurls a 100-pound shell fifteen miles. It is a 155-millimeter giant weighing fif-

teen tons, yet despite its size it can be moved to the strategic point of action on its ten-wheel pneumatic-tired carriage at twelve miles an hour. In a test at Ft. Bragg, N. C., the gun fired a shell about 25,000 yards and blasted a sixteen-foot hole in the ground. This was the longest shot ever fired by an American army field piece. The function of the gun is to bombard enemy ammunition dumps, communication lines and reserve forces behind the battle lines. Only the stationary coast-defense guns are larger than the field piece.



Ramming home a charge for test shot that traveled 25,000 yards. This gun is the biggest field weapon of the U. S. army

Developed by Army Ordnance



# TOUCHDOWNS

was on weight and strength; today it is on speed and brains. Only the fastest, brainiest, and best-conditioned men make the California Golden Bear teams."

Football in the United States earns some \$10,000,000 a year while \$20,000,000 is invested in stadiums, gymnasiums, and equipment. Each fall about 8,000,000 spectators watch 100,000 youths play the game. A



2599  
FROM the hammer-and-tongs affair of yesterday, football has developed into a scientific sport—one that requires long and weary hours of practice. Saturday's gridiron stars are as carefully trained and conditioned as Kentucky Derby entries.

"Stub" Allison, head football coach at the University of California, sums it up this way: "Twenty-five years ago the development or selection of varsity football material was largely a survival of the fittest—the toughest, the biggest and strongest men. The emphasis

*Top, training kicker to get more height into punts. Bottom, target used to train the passer is a tire mounted on upright standard*



Cont Andrew Hamilton, 75 34 28  
Beverly Glen Blvd. West Los Angeles  
calif

# in the MAKING

Right, player making flying tackle on a blocking bag. Below, interference knocking blocking bags out of the way so that the ball carriers may get through the "opposition line"



football player spends approximately 150 hours in practice during the fall months, but actually plays, on the average, only about 150 minutes.

Before football became one of the country's most popular sports, science had little part in the training of a team. Today, however, charging machines, pushing sleds,

tackling dummies, blocking bags, passing hoops, centering targets, motion pictures, arm and leg exercisers, and electric and water therapy treatments all aid in helping a player reach and maintain perfect physical condition.

Coach "Babe" Horrell of the University of California at Los Angeles says: "Some





coaches condition and train their players on 'live bait.' I prefer to save my men, even third and fourth stringers, from rough scrimmage. I would rather let them expend their energy against charging machines and tackling dummies where there is less chance of injury. Such mechanical devices have undeniable advantages over live bait. On a charging machine, for ex-



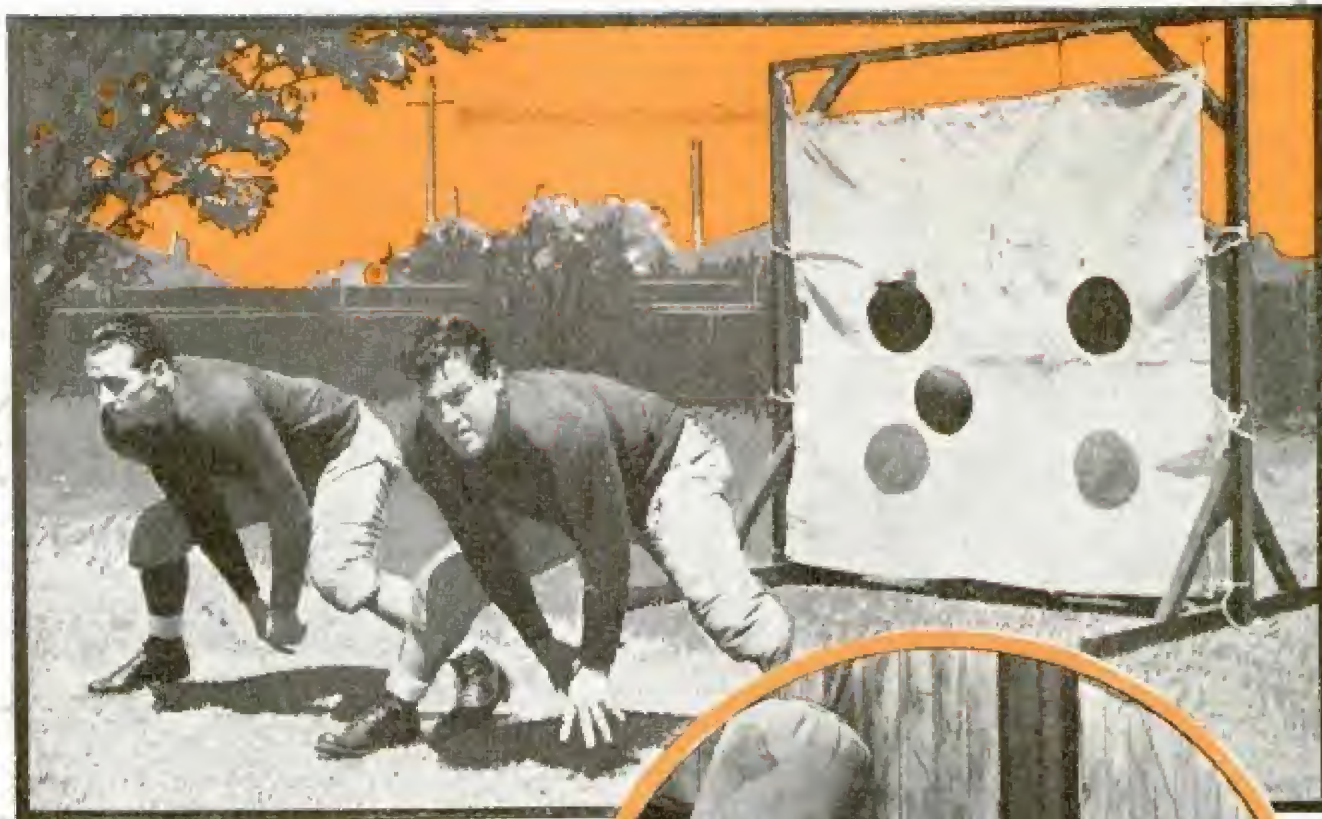
ample, a player learns to get a sustained drive that he cannot learn while charging against another player. Muscular coordination, timing and distance are better taught with mechanical aids."

Coaches are almost unanimous in voting the charging machine their most valuable piece of equipment. This is a huge device, on runners or rollers, against which seven men charge at the same time. At U. C. L. A. one of the latest models is equipped with padded arms and powerful coil springs. The number of pounds that a charging player exerts against the machine is recorded on a sliding scale. Such a machine allows a coach to observe all seven linesmen at the same time. If one end of the line is loafing on the job the machine pivots in that direction. Coaches standing on the charging machine can pick out defects and teach



*Top, charging sled reveals flaws in linesmen's play. Center, sliding scale of charging machine. Bottom, linesmen drilling with charging machine*





linesmen the correct charging position—back straight, eyes up, and legs under the body for greater traction.

Some universities have adopted a smaller, two-man charging machine. It is made of steel with two padded arms. Such a machine is helpful to the coach in showing up the flaws of individual players.

The charging sled is a large frame arrangement somewhat like the charging machine, but instead of players battering against a padded arm with their shoulders, they push on a high crossbar with their hands. The sled develops arm, shoulder, and back muscles and teaches the correct use of the hands on defense.

Blocking and tackling are the fundamentals of any first-rate football team. Such national-ranking outfits as Minnesota, Southern Methodist, Fordham, Pittsburgh, California, and Washington are noted for clean tackling and crisp block-

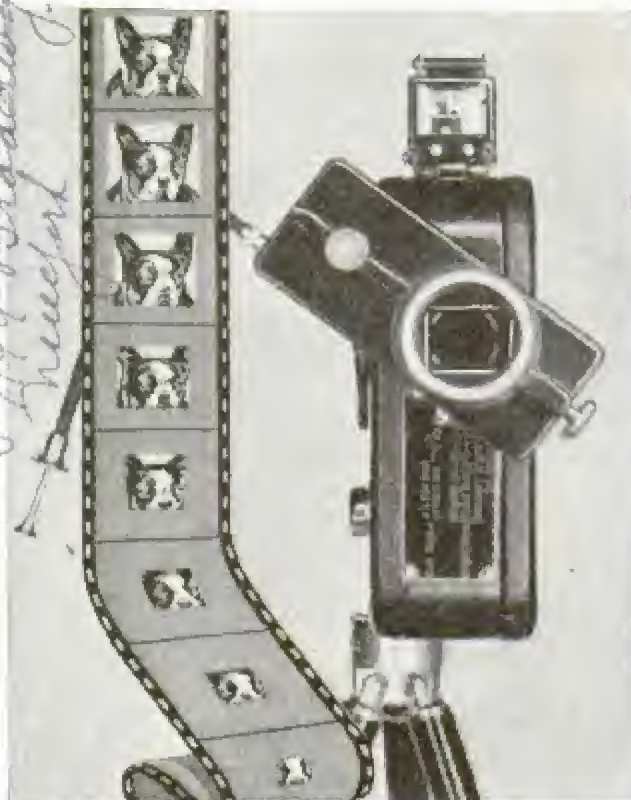
(Continued to page 124A)



*Top, centers learning accuracy by striving to pass the ball through holes in canvas. Circle, rubber-supported dummy gives "live" opposition to charging player. Bottom, motion pictures of previous games show players their mistakes*



## Movie Fadeout Attachment Worked by Cable Release



Fadeout attachment is mounted on movie camera so that it does not interfere with view finder

Amateur movie makers can produce "fadeout" effects by means of a camera attachment just made available. Made of Bakelite, it is offered in various sizes and can be mounted in several positions to avoid interfering with the view finder. By pressing the cable-release plunger a rectangular fadein or fadeout is produced.

## Midget Racing Car Is Carried on a Monowheel Trailer

When the "Baby Bluebird" is not racing under its own power it can ride on its own monowheel trailer. Both the midget car



Looking like a toy, the baby racing car powered by motorcycle engine rides single-wheeled trailer

and its special trailer were built by J. H. Collier, Jr., of Oakland, Calif. The little racer is powered by a thirty-five cubic-inch motorcycle engine of 1913, and has topped thirty-two miles an hour.

## "Leak" Meter Detects Auto Valve in Need of Grinding

Leakage of compression through valves of an automobile engine, indicating that they need to be ground or replaced, is shown quickly by a sensitive electric meter, without removing anything except the spark plugs. Six volts from the car battery will operate the instrument, and fifty or more pounds of air pressure, which also is needed, can be obtained from the regular service-station compressor. In making a test the piston must be on compression stroke so the valves are closed. Then, with the air line attached to the instrument, air is forced into the cylinder through a rubber nozzle that is inserted in the spark-plug port. Any leakage of air through



Testing valves of automobile engine for leakage with electric meter and compressed-air line

valves, no matter how slight, is instantly picked up by the meter. To tell when a piston is on compression stroke, the spark plug is removed and a whistling signal, supplied with the meter, is put in its place. The engine is turned over until the whistle sounds under pressure of air in the cylinder. At that point the piston is entering on the compression stroke.



# Five Million Volts Bombard Secrets of Atom

Ready to crack wide open the mysteries of the atom is a 5,000,000-volt machine in the observatory of Carnegie Institution of Washington. The atom smasher itself is enclosed in a steel tank resembling an inverted pear, fifty-five feet high, the lower part of the tank surrounded by a brick structure. In earlier experiments with a 1,200,000-volt generator the Institution scientists were able to measure directly in grams or ounces the attractive force between component parts of atomic nuclei which results in two atomic particles joining, under high-voltage bombardment, to form an atom of a heavier element. The new equipment will permit experiments at potentials as high as five million volts.

Steel tank resembling inverted pear, surrounded by brick wall, encloses Carnegie Institution's atom smasher

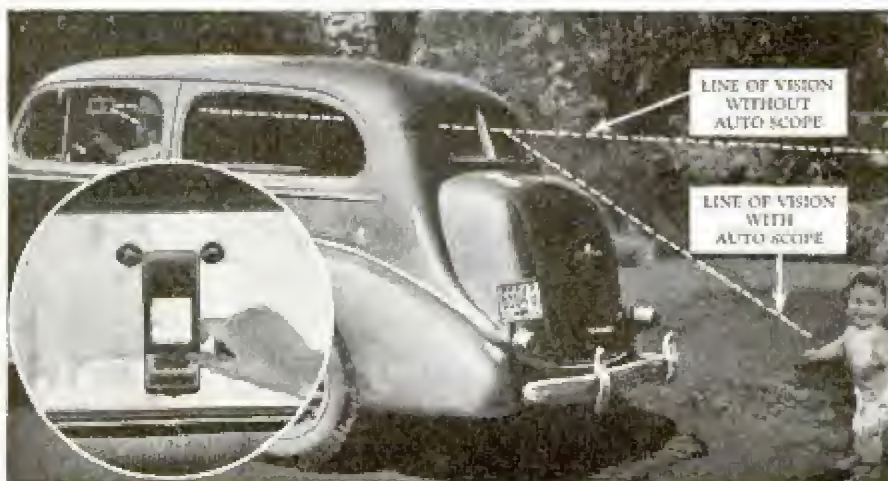


Emb.-f. United States Advertising Co. Toledo, Ohio

## Periscope on Rear Window Makes It Safer to Back Car

To lessen the accident hazard in backing an automobile, a "periscope" just devel-

oped gives the driver a close-up view of the immediate rear of the car. It is at-



Inset shows periscope attached to rear window by suction cups. Driver watching rear-view mirror can see ground in immediate rear of car

tached by suction cups to the inside of the rear window, and picks up a view of the ground just back of the car on a convex mirror which reflects it to a flat mirror and thence to the rear-view mirror mounted on the windshield. Thus a glance at the rear-view mirror would prevent the motorist from backing into a pedestrian or child or locking bumpers with another car.

The Autoscope Mfg. Co. Delta, Ohio



2677  
 C.M.C. Thomas & Stinson, Jr.  
 10555 Holman Ave  
 Los Angeles, Calif

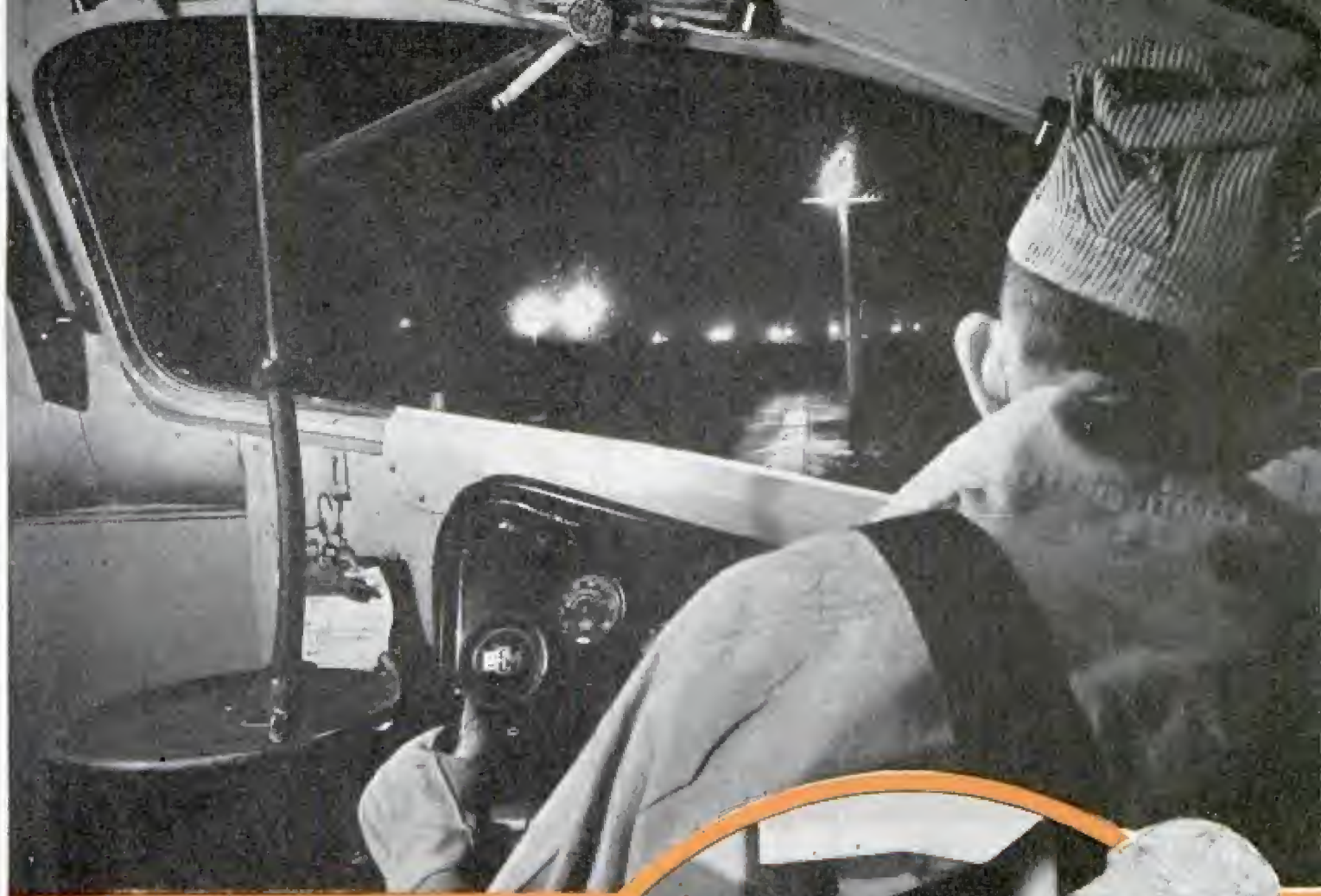
Rel: E.B. Ryder, Industrial Agent, Santa Fe Railway, 1000 Main St, Los Angeles, Calif

# DIESEL LIMITED

**F**OR a close-up look at modern high-speed railroading let's ride the cab of the "Super Chief" on part of its regular run between Los Angeles and Chicago. It's two o'clock in the morning and the train is racing east across the California desert. In the bright light of the headlight beam the ties blur from the speed. The speedometer needle hovers steadily at just over 100 miles, yet Engineman Earl Gilbert sits relaxed at the controls. The track ahead curves to the left and the engine swoops into the turn like a banked airplane. A steam locomotive fights a curve but the Diesel has horizontal shock absorbers that take up the pull of the rails. With its low center of gravity the streamliner can hit curves much faster.

Top, "Super Chief" races through night. Below, opening shutters that send air to Diesel radiators



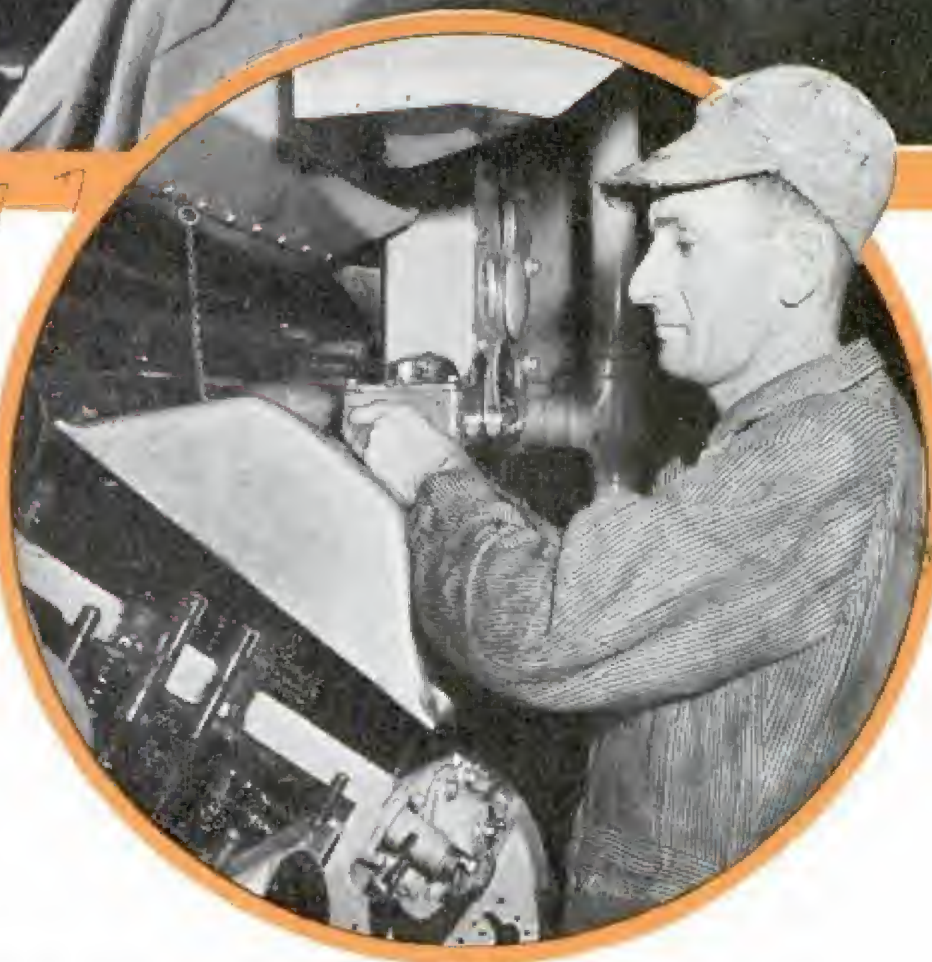


*Above, engineer throttles down as streamliner approaches town. Right, lifting aluminum valve covers from Diesel engine for overhaul*

From the cab, full speed is merely a reading on the speedometer and a louder hum from the engines. Not until the engineman throttles down and the engine seems to crawl along at sixty miles per hour do you realize how much faster you had been going.

To an automobile driver full power means top speed, but from your seat in the cab you notice the train usually slows down when the engineman turns on more power. Paradoxically, speed picks up again when he reduces the throttle. That's because he anticipates every change of grade and speeds up the engines just as he hits a climb that may be too gradual for you to see. At the top he shuts off power and the engine coasts along; now it is going downhill and its speed increases.

There are a score or more of instruments within reach of the engineman's hands, but



throttle and brakes are all he needs to run the train. The rest are safety devices. There is a cord to a second powerful air horn in case the standard horn fails. Colored lights wink in front of him when an engine heats up or other mechanical trouble occurs and an alarm gong rings as an additional warning. The wide windshield





world. The grey-walled engine room resembles the interior of a submarine and the narrow passageways and hot oil-soaked atmosphere complete the illusion. As a matter of fact the heavy Diesels are identical, except for a few auxiliary fixtures, with those used in the navy's submersibles. You can hardly yell loud enough to make yourself heard above the roar of the power plants. Eighteen hundred horsepower is being manufactured under the gleaming valve covers and in a second power car behind us two additional twelve-cylinder engines are producing the same amount of power.

Engine speeds are held within narrow limits and have no relation to the speed of the train because the



*Top, engine maintainer inspects air cleaner on 900-horsepower Diesel. Below, horizontal shock absorbers enable "Super Chief" to take curves at high speed*

is of safety glass, has electric windshield wipers, metal sunshades, and is equipped with hot-air defrosters. Under foot is the "deadman's control" that automatically throttles down the engines and applies brakes if the engineman removes his foot from it.

For a look at the power plant you move back through a soundproofed door and step down into a completely different

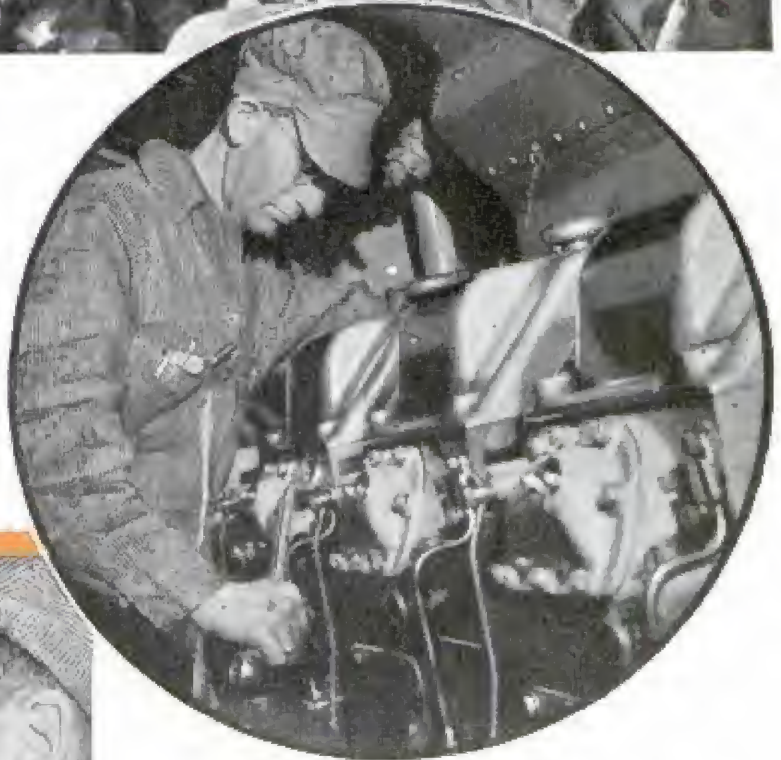
engines create more torque instead of more revolutions per minute when the engineman opens his control throttle. The throttle controls the speed of the traction motors on the wheels and these motors in turn demand more current from the dynamos when the throttle is opened. Relays operated by the dynamos then supply more fuel to the Diesels, allowing them to pull better against the heavier load, thus main-



taining dynamo speeds to keep the wheel motors pulling.

Usually the engine maintainer who keeps watch over the power plants has little to do except watch his instruments and make routine adjustments. He can repair almost any minor failure. Electrical shorts, a broken fuel line, sticking valves, and repairs to the steam boilers that furnish heat for the air-conditioning system of the train are easily attended to. Even such a major breakdown as a burned-out connecting rod rarely delays the train because the maintainer can cut the engine out, remove the faulty assembly, block off the cylinder ports, and put the engine back to work again.

The "Super Chief" is the pride of the Santa Fe system and is one of the world's fastest long-distance trains. Each trip is a race against time. It has to be, to get you



*Top, engineer with hand on brake lever in sound-proofed cab. Center, making minor adjustments on one bank of twelve-cylinder Diesel. Bottom, checking engine conditions by exhaust temperatures*

three-quarters of the way across the continent in a little more than a day and a half. Twelve relays of enginemen handle the controls and each is an expert at gaining part of a second on a curve, picking up additional seconds in fast acceleration when the board gives him a clear track, and in saving whole minutes at a time in the wide-open stretches. With Diesel equipment the engineman can get his train started and up to top speed in one-third the time and space that he can with steam. He can hold high speed right up to the beginning of a curve and be running wide

(Continued to page 130A)



# Motorboat Like an Auto Attains 35-Mile Speeds

*no further data*



Two views of police patrol boat show how closely it resembles an auto

Closely resembling an automobile, a new type of motorboat was tested recently for use as a police patrol on the Thames. Powered with a nine-horsepower motor, the craft is capable of a speed of thirty-five miles per hour. In addition to looking like an auto without wheels, the craft provides motorcar comfort and protection from the weather for its occupants.

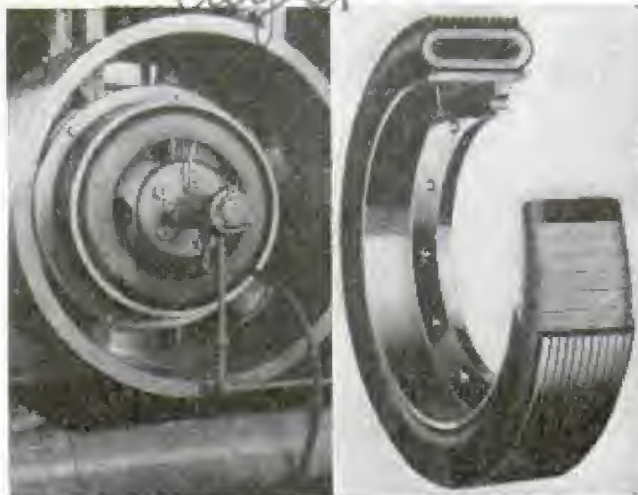
## Mystery Chemical Holds Secret of How Plants Breathe

Discovery that it is some mysterious chemical that allows green plants to breathe carbon dioxide was made recently by Dr. E. D. McAlister, of the Smithsonian Institution. This chemical acts as a go-between, capturing a molecule of carbon

dioxide from the air and delivering it to the chlorophyll, green coloring matter of the plant. While making very delicate measurements of the carbon dioxide used by wheat seedlings, Dr. McAlister found the plants continued to breathe the gas even a short time after plunged into darkness, which was contrary to beliefs of scientists hitherto. He concluded that an intermediate chemical was playing a part, but because of its fleeting existence he doubts whether the chemical will ever be isolated. Chlorophyll enables the plant to absorb the sun's energy to manufacture from water and carbon dioxide the various hydrocarbons—cellulose, starch, etc.,—used by men and animals for food and fuel and manufacturing.

## Self-Adjusting Rubber Clutch for Industry

Constructed with a multi-vented surface that is said to cling to steel more tightly than do con-



Rubber clutch (right) developed by General engineers is shown on industrial machine (left)

*Washington, D.C.*

*General Electric*

*bio physicist*

*2798*

*Airflex*

*2767*

*2654*

*Scientific Service 715/39*



9722 pose

## A black and white photograph showing five male sprinters in their starting blocks on a wet track, ready for a race. They are all in a crouched starting position. In the background, there is a building with a corrugated metal roof. The ground is wet, reflecting the light.

cl. no. Maioroli  
Nanni



no further information.

❖ Synthetic gasoline made in Japan costs three times the market price of imported gasoline.

imported gasoline.  
Science Service.  
7/19/39



18/544 ashman/Kodak Co.  
Rochester, N.Y.

# SHOOTING *the*



*Automobile headlights furnished the illumination for that theatrical rainy-night scene at left. The dog is a toy. A short time exposure produced the desired effect. Sunbeams slanting through window, at bottom, spotlight toys on the floor; indoor pictures like this require enough exposure to bring out shadow detail*

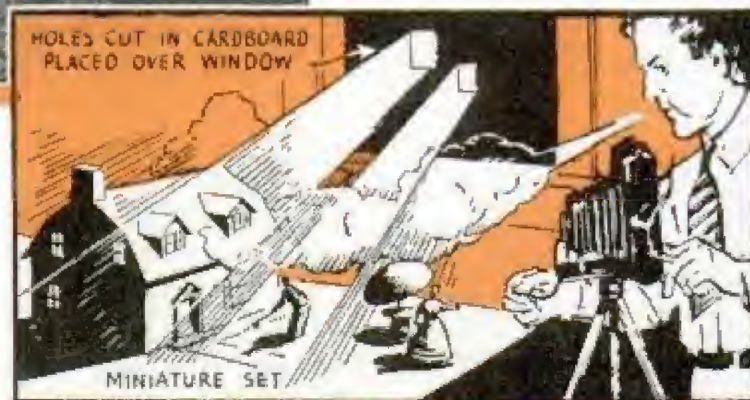
**P**ICK yourself a sunbeam. Set the stage for your camera in the spotlight that slants through the dancing dust of the living room.

The simplest and homeliest of subjects make great pictures if the light is right, and the amateur cameraman need not array a vast battery of artificial lights and reflectors to capture a prize. Just shoot the sun.

You can trap sunbeams in any sort of camera. All you need is the right film and the right exposure time. Sunbeams are merely light falling on tiny particles of dust or mist or smoke in the air, and when that light escapes through a small window or a break in the clouds, forming a narrow, slanting shaft, it's time for the cameraman to go to work. The darker the surroundings, the more brilliant is the sunbeam by contrast.

So hunt your picture in dark rooms and in deep woods; in railroad stations and roundhouses, in factories and narrow alleys where smoke and steam and dust cooperate with you.

Oftentimes, sunbeam pictures at home are intensified by suffusing the beam with tobacco smoke. This stratagem can be utilized in making table-top pictures. Make your own miniature artificial sun-



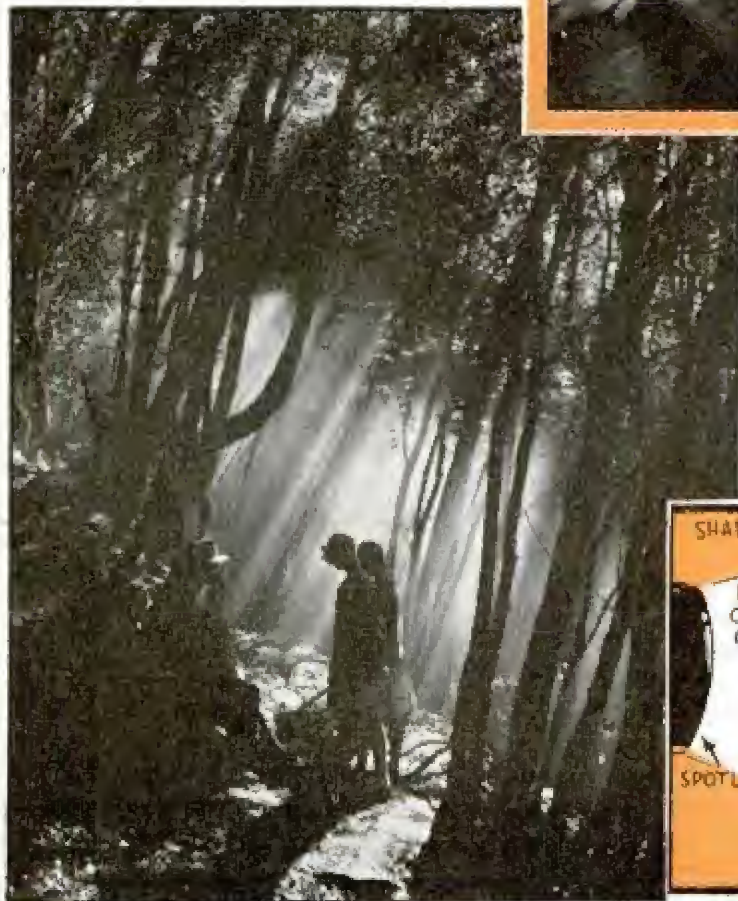


4451A

# SUN



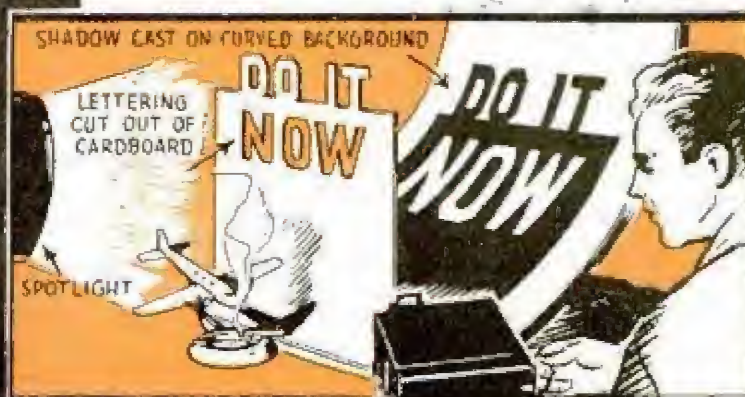
*Sunburst, above, called for minimum exposure and a yellow filter to deepen blue sky tone. Proper control in developing and printing can make it appear a moonlight scene. Right, sunlight and shadow on wall make pleasing setting for child picture. Below, short exposure keeps trees dark and emphasizes sunbeams filtering down*



beams by shining light through a small aperture in a sheet of cardboard, and blow a puff of smoke just before you snap the shutter.

When your sunbeam scene has high contrast, as in a dark interior or deep woods, give a reasonably full exposure—not too long—but enough to record some shadow

(Continued to page 120A)





## Sight Restored to Semibind by Five-Lens Magnifiers



Fitting the cone-like magnifier spectacles on a patient. The lenses have extremely high power

People partly blinded by eye-nerve disease are able to see clearly with the aid of the teloptic-magnifier, a new type of spectacle lens. With a magnification of 300 per cent for distance vision, the glasses already have returned children from blind institutions to the public schools. Made up of a combination of from three to five lenses for each eye, the magnifier looks like a glass cone, but it is light enough to be fitted into an ordinary eyeglass frame. It is estimated that fifteen per cent of the 200,000 persons now classed as blind in the United States can be aided by the magnifier.

## Emery Wheel on Hand Sharpener Gives a Keen Edge



Long blades like those used in paper cutters, scythes and tin-smiths' knives can be given a keen edge and a uniform bevel with a hand-operated sharpener equipped with an

emery wheel. As the tool is drawn along the blade, the grinder rotates automatically to speed the sharpening action. Being adjustable, the unit will fit most blades, and two handles provide a firm grip.

## Home Plate Dusted by Air Blast to Relieve Baseball Umpire

Baseball umpires will be relieved of the duty of sweeping off the home plate periodically during a game if an automatic duster, operated by compressed air, is put into general use. At a ball park in Wichita, Kan., the idea is being tried out. A small cylinder installed in the plate is raised by an air pressure of 150 pounds, and air forced out through holes in the cylinder blows off the dust, leaving the home plate clean and visible. When pressure is released the cylinder drops back out of sight.



Compressed-air cylinder installed in home plate blows dust away and then sinks out of sight in the base

Introduced at American Academy of Optometry, held at Los Angeles, Calif.

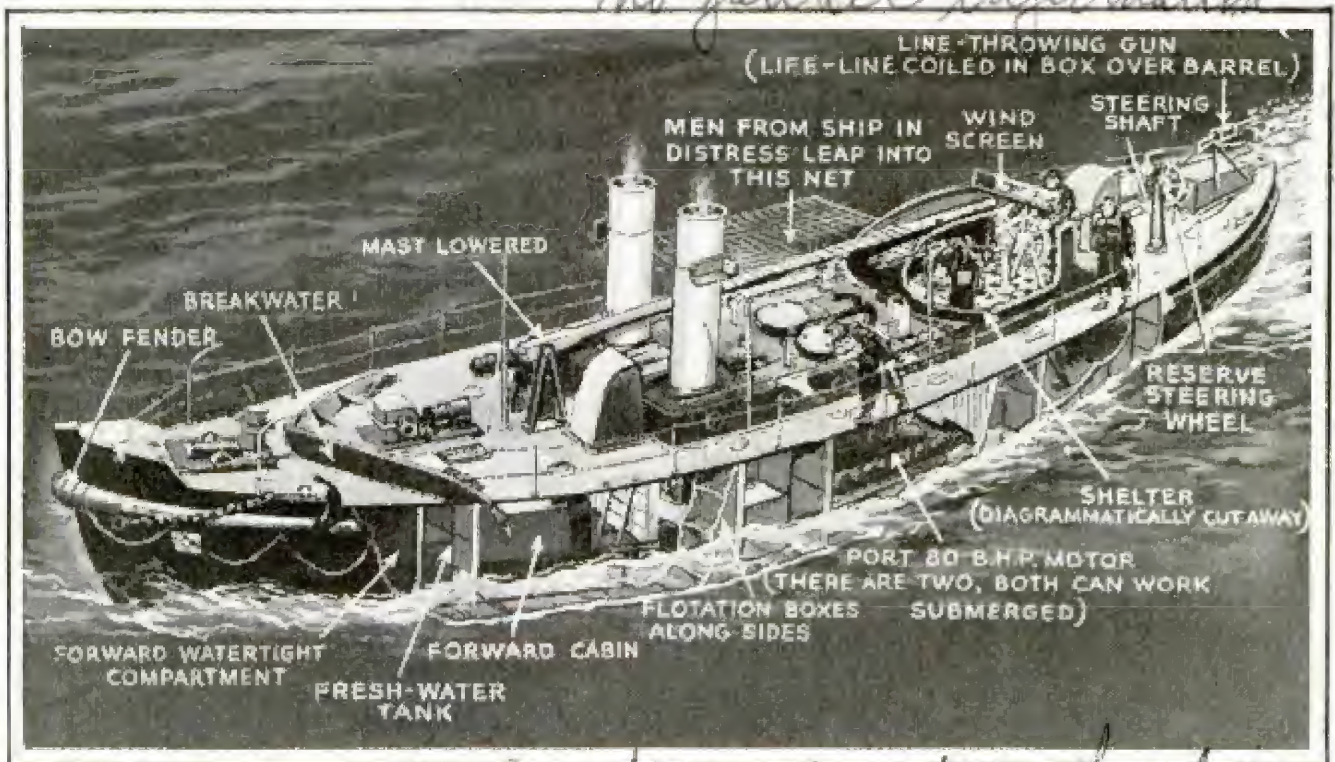
780

Swigart Knifesharper

Mr. William Synbloom, National Semi-Pro Baseball Congress, Wichita, Kansas



# Lifesaving Craft Empties Itself of Water



Diagrammatic sketch of latest British lifesaving craft shows such features as watertight compartments, life net, line-throwing gun and mast which can be raised or lowered when necessary

Powered by two eighty-horsepower engines arranged so they continue to operate even when the compartment becomes partly filled with water, a British lifesaving boat has a self-emptying system. The floor of the boat, which is above the water line, has a number of large holes, at the upper end of which are fitted valves that allow the

water to drain out, but not to enter. The boat is manned by a crew of eight. Its lifesaving equipment includes a net, stretched above deck, into which persons may leap from distressed ships. There is also a line-throwing gun and a mast that can be raised or lowered. Air chambers in the sixty-one foot craft give it more buoyancy.

## Wooden Hay Rake on Farmer's Sedan Gathers the Crop

When it's threshing time in Kentucky, a farmer near Franklin puts the "cowcatcher" rake on the front bumper of his automobile and gathers his crop in comfort. The improvised wooden rake slides easily along, holding as much as a wagon-load as the farmer drives up and down the windrows. A quick shift into reverse dumps the load.

Kentucky farmer gathers hay on wooden "cowcatcher" rake and dumps it by backing the car quickly. It is attached to the front bumper





Cont. James McQueen. 431 W 60th St.  
New York City. Kansas City, Mo.



Left, the big-eared African elephant, capable of surprising agility in spite of his weight, is regarded by many as king of the jungle. Below, Rose, a famous performing tiger of the author's circus act



# Which IS *the*

By Clyde Beatty

**N****A**TURAL history books call the lion King of Beasts—but is he? Or does the title rightfully belong to the tiger, the elephant, the African buffalo, the gorilla, or some other jungle terror?

In my attempt to answer the question I'm going to draw on my own experience, covering sixteen years in the big cage, and the ideas gathered from other animal men, zoologists, and authorities who have stalked the jungle with rifle and camera.

**KING**  
*of*  
**BEASTS**  
**?**

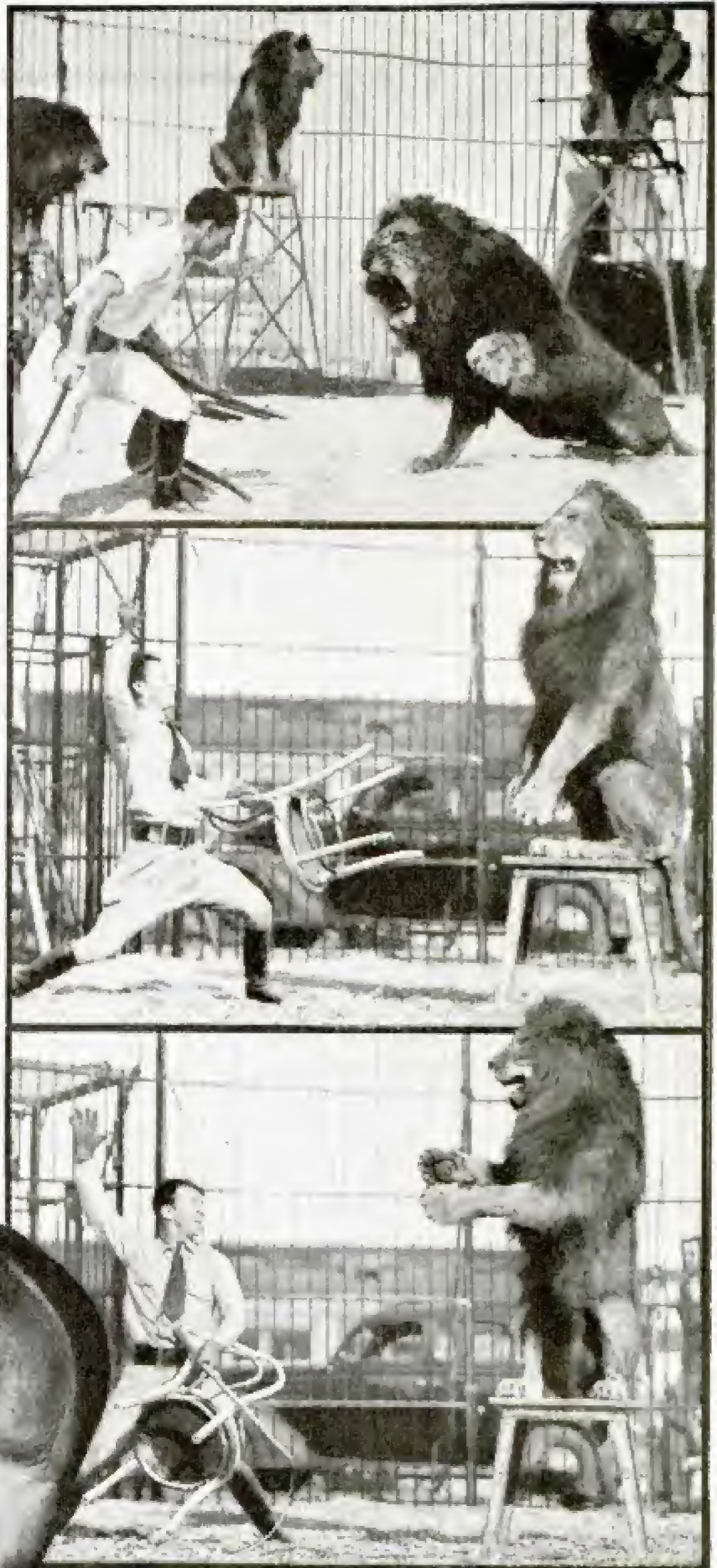


A logical starting point is the question that's been asked me ever since I first set foot in the steel arena: Can a tiger lick a lion? No, in nine cases out of ten, I think a full-grown lion could whip a full-grown tiger. Study the fighting equipment of the two and you'll be inclined to agree.

A tiger is razzle-dazzle, hopping in with teeth and all four feet. He'll bite and lash at an opponent with blue-flame fury, but unless he happens to strike a vulnerable spot, no great damage is likely to be done. His handicap in weight is offset by his speed, but once checkmated, he's apt to assume a defensive style.

Not so with the lion who fights like a dog with only his front paws and teeth. He carries the fight to his opponent, centering the attack on the tiger's throat while his heavy mane protects his own throat. And with his extra weight in the forequarters, he can "take it" better than a tiger.

When it comes to a brawl, lions are no gentlemen.



Left, the hippo can throw his 8,000 pounds around with amazing speed when he's aroused. Above, top to bottom, the author putting a lion through a performance. The photo at top shows the lion apparently in a state of rebellion

*Menelick*





*Above, the gorilla whose fighting ability is not as great as his ugly appearance would indicate. Right, Beatty believes a lion can conquer a tiger under most conditions. Below, the author putting Mene-llick through his famous praying act*



They have no compunctions about gang-ing up on an enemy and I have seen as many as six or seven doing battle with a single tiger. If a striped cat, on the other hand, gets himself involved in a squabble,

the others rarely, if ever, raise a paw in his behalf.

Since I first began mixing the two species, twenty-five tigers have been killed in the circus arena wars but there hasn't been a single lion casualty. However, only two victims were Siberian tigers, the others Bengals. The tiger toll might not be so great had Siberians, which are bigger, and, I think, stronger, figured in all fights.

In my opinion, the big-eared African elephant is the lord of the jungle. For all his bulk—a museum in Cape Town has a specimen measuring twelve feet two inches, which weighs between seven and eight tons—the pachyderm has the odd gift of being

light on his feet. A dog cannot lie down and regain his feet with less trouble than an elephant. He can stand on his back feet, on his front ones—and on his head.

Being unpredictable, the African elephant has been virtually exiled from circuses but a joust an escaped tiger had with one a few years ago is worthy of mention. No sooner had the tiger gained his freedom than he espied the elephant. There is a mutual hate between the two so the tiger made a flying leap for the other's trunk. The elephant shook the cat off only to have the latter circle around and bite him in the hind leg. Finally, with a terrific kick, the tiger was sent sprawling. While picking himself up he saw a baby camel standing beside its mother and he lost interest in the elephant. Without delay, he killed both camels.



Barney, a dwarf elephant, scored several victories over lions when matched with them in the feature attraction of a Mexican circus.

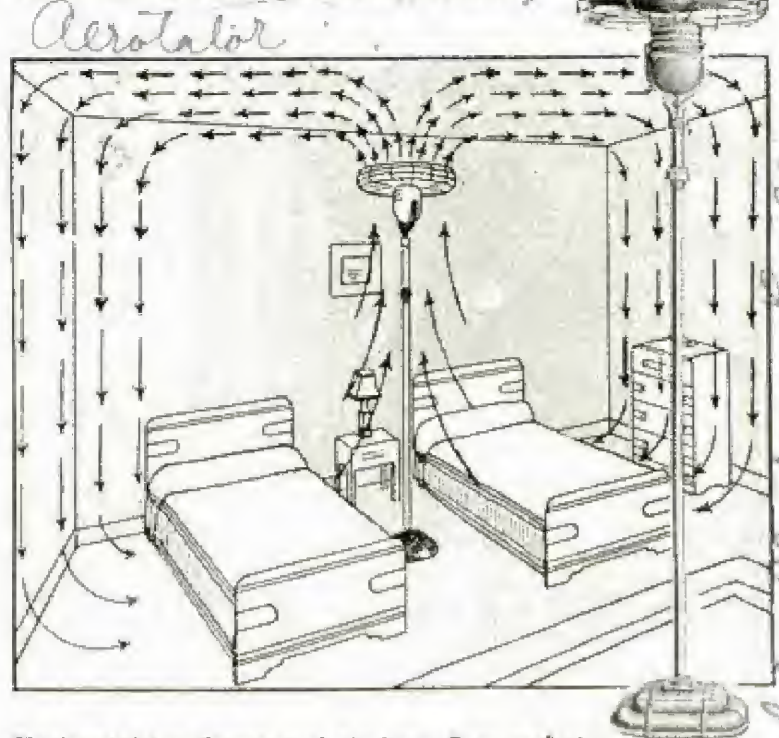
In ranking jungle fighters, the African buffalo should not be overlooked. A cruel temperament, a set of wicked horns, a concrete forehead, and four sharp hoofs comprise his tools of torture. Big game hunters have told me how a lion, after lying in ambush until a buffalo comes to his watering hole, will catch him unawares by jumping him from behind. Buffaloes discourage this practice by shaking the cats from their backs and killing them with their horns.

With his double-horned snout, the rhinoceros has dealt out plenty of misery to the jungle trouble-makers, but his faulty eyesight keeps him out of the championship class. A gorilla has plenty of heft in the chest and arms and a high degree of intelligence—great assets for any scrapper—but the late Martin Johnson, who spent considerable time in Africa studying their habits, was of the opinion, that as a fighter, the gorilla was greatly over-rated.

The hippopotamus is a better battler than his sloppy, good na-

(Continued to page 119A)

## Ceiling Fan Blows Air Upward for Good Circulation



Horizontal fan draws cool air from floor and circulates it through room without perceptible draft

Air circulation without uncomfortable drafts is provided by a horizontal fan that drives the air toward the ceiling. A pedestal fan or ceiling fixture accomplishes the same object, creating a gentle and uniform airflow upward to the ceiling, outward to the walls and then down to the floor. The moving air is cooling in the summer, and in winter it helps eliminate cold floors and keeps the ceiling heat circulating through the room.

## Hospital Hides from Raiding Planes under Camouflage



English hospital camouflaged to evade eyes of enemy planes

Formerly a conspicuous landmark and an excellent target for enemy bombing planes, a hospital at Barnet, England, has been repainted in wavy stripes of buff and green to blend with the surrounding countryside, making the building almost invisible from the air. This is part of England's defense preparations in the event of war.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped envelope.

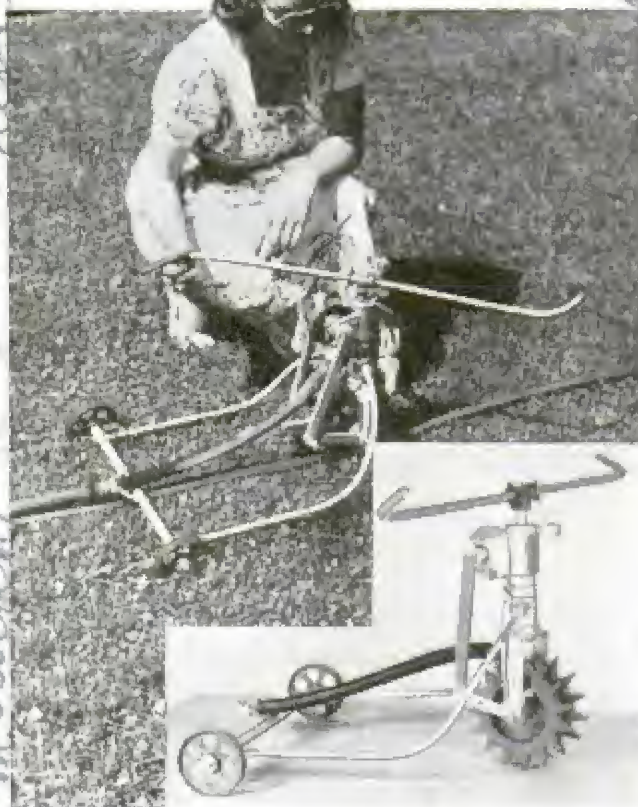


## Sprinkler 'Walks' on Lawn Using Hose as Track

\$29.50

\$49.50

\$69.50



Lawn sprinkler travels about using hose as track. Note spiked dual wheel, in inset, that grips ground.

Literally walking by itself, a sprinkler mounted on spiked wheels moves over any course outlined by the garden hose. You simply lay out the hose, place the sprinkler properly, turn on the water, and let it run until the route is covered. The machine will crawl around trees and shrubs, and pull fifty to 100 feet of hose behind it. A pair of spiked wheels in front form a groove to slide over the hose and serve as a guide. Rotation of the sprinkler is so geared with the walking wheel that the speed of advancement may be varied.

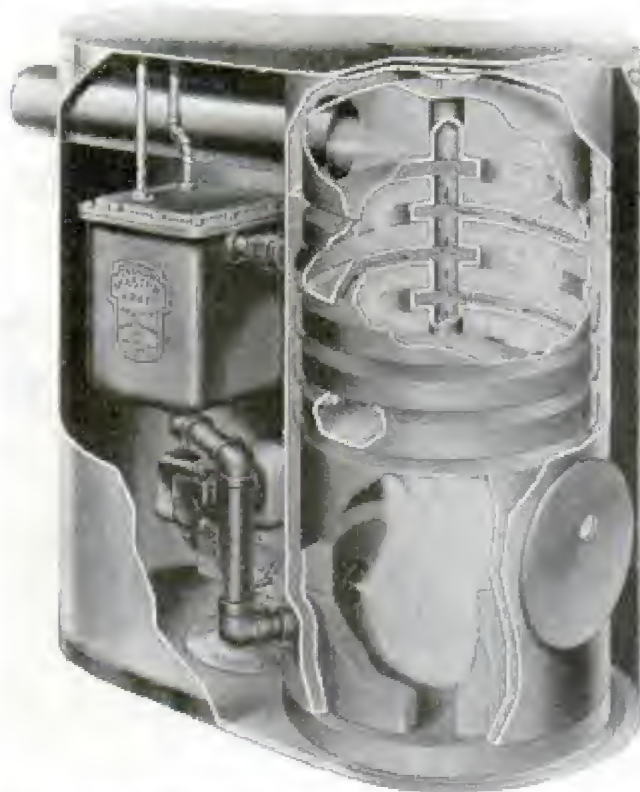
## Cure for "Rail Cancer" Found in Slower Cooling of Steel

Science has found a cure for "rail cancer," those hidden fissures in steel that have caused many a broken rail and consequent train wreck in the past. The problem had baffled railroad men for years. In 1937 there were 18,000 bad rails replaced on American lines. Deep in the rail, never

noticeable on the surface, could be found tiny "shatter cracks" that under certain conditions would spread until the rail was nearly severed. In a test laboratory at the University of Illinois a loaded car was run millions of times over rails until it was discovered that only loads of 40,000 pounds or more, frequently repeated, would cause rail "cancer." However, this was a greater load than encountered in actual traffic, and further tests showed that the 40,000-pound blow could be struck if the wheel was off balance or flat, or the track was not uniform. Then a Canadian metallurgist found that by slowing down the cooling rate of steel rail, cancer could be prevented. Rails cooled in the new way were tested at the university and not one developed a fissure under laboratory pounding. The increase in manufacturing cost is only two per cent.

## Boiler Built Like a Percolator Generates Steam Quickly

Steam has been generated in less than ten minutes from a cold start by a "percolator" boiler just put on the market. Oil-fired, it works like a coffee percolator; a hollow central tube runs from bottom to top of the boiler. As the hot combustion gases weave back and forth on their way



Cutaway drawing shows how water rises in central tube as it heats, bursting into steam as it hits top



to the chimney they heat several thin layers of water in "crowned" sections, and as the water heats it rises, enters the central tube and shoots upward. Emerging from the top of the tube the water strikes a baffle like the glass dome of the percolator; this forces the water out sideways and it turns almost instantly into steam as it encounters the surrounding dry, hot steel surface.

## Swinging Wrench Handle Loosens Tightest Bolts

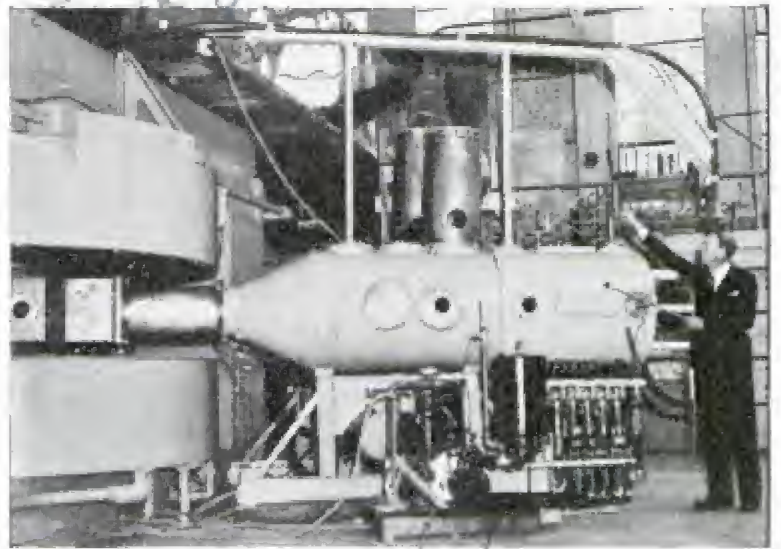
Tight bolts difficult to remove without injuring them, can be loosened with a wrench that delivers a sharp blow without the



Dotted line shows how handle of wrench is swung to deliver blow to stubborn nut

use of a hammer. In operation the center of the wrench shaft locks over the nut, and a pounding action is obtained by swinging the handle half way until it strikes raised lugs, thus carrying the force of the impact through the tool. Weighing about seventeen pounds, it is claimed the wrench makes it possible to unscrew even the tight bolts on dual wheels.

## Atom Smashers Aim Big Gun with a Ten-Million-Volt Beam

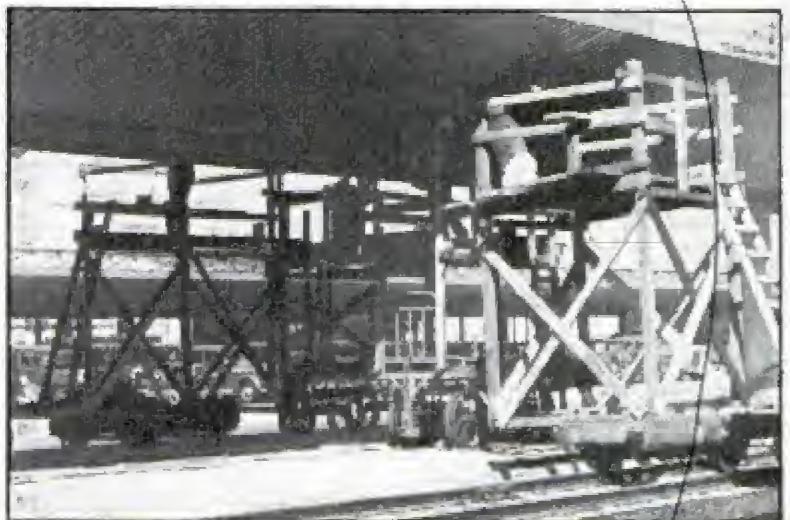


Alchemist's dream come true is this powerful cyclotron whose 10,000,000-volt beam can change one metal into another

Scientists are bringing bigger and bigger guns into play in their efforts to break down the atom and transmute old metals into new. At the University of California a 225-ton cyclotron is near completion, and in preliminary tests a 10,000,000-volt beam of deutons—"atomic bullets"—has been developed.

## Scaffolds Are Mounted on Flat Cars to Aid in Painting Train Sheds

To speed up the work of painting the train sheds at the new Union Passenger Terminal in Los Angeles, the station superintendent rigged scaffolds which he mounted on flat cars running on adjoining railroad tracks. This saved moving the scaffolding, paint and equipment by hand.



Scaffolds riding on flat cars move along tracks, saving time and extra labor of handling material as work progresses

Jari Products  
Inc. 2948 Pleasant

d w. J. C. Hodgson



g 320 Leggill

# WINNING *the* WAR *on*



Congestion such as that in street at left can be eliminated by education, enforcement and engineering. Above, ten-foot sign has letters and arrows clearly read by day or night

In other words, we must go on saving lives and, in building America back to normal prosperity, we will actually expose more lives to the danger of highway accidents.

In 1935 the accident rate was approximately eighteen per 100,000,000 vehicle-miles. In 1936 it was reduced to sixteen and four-tenths, in 1937 it was fifteen and eight-tenths and in 1938 it reached the remarkable low level of twelve per 100,000,000 miles. There were 8,000 fewer fatalities last year and, assuming a proportionate reduction

in injuries and property damage, a saving of approximately 200,000 injuries and \$250,000,000 in cash loss.

This work was accomplished by a careful and well-administered program of Education, Enforcement and Engineering, the now famous three E's of safety. Engineering concerns the work of providing better mechanics for automobiles and better me-

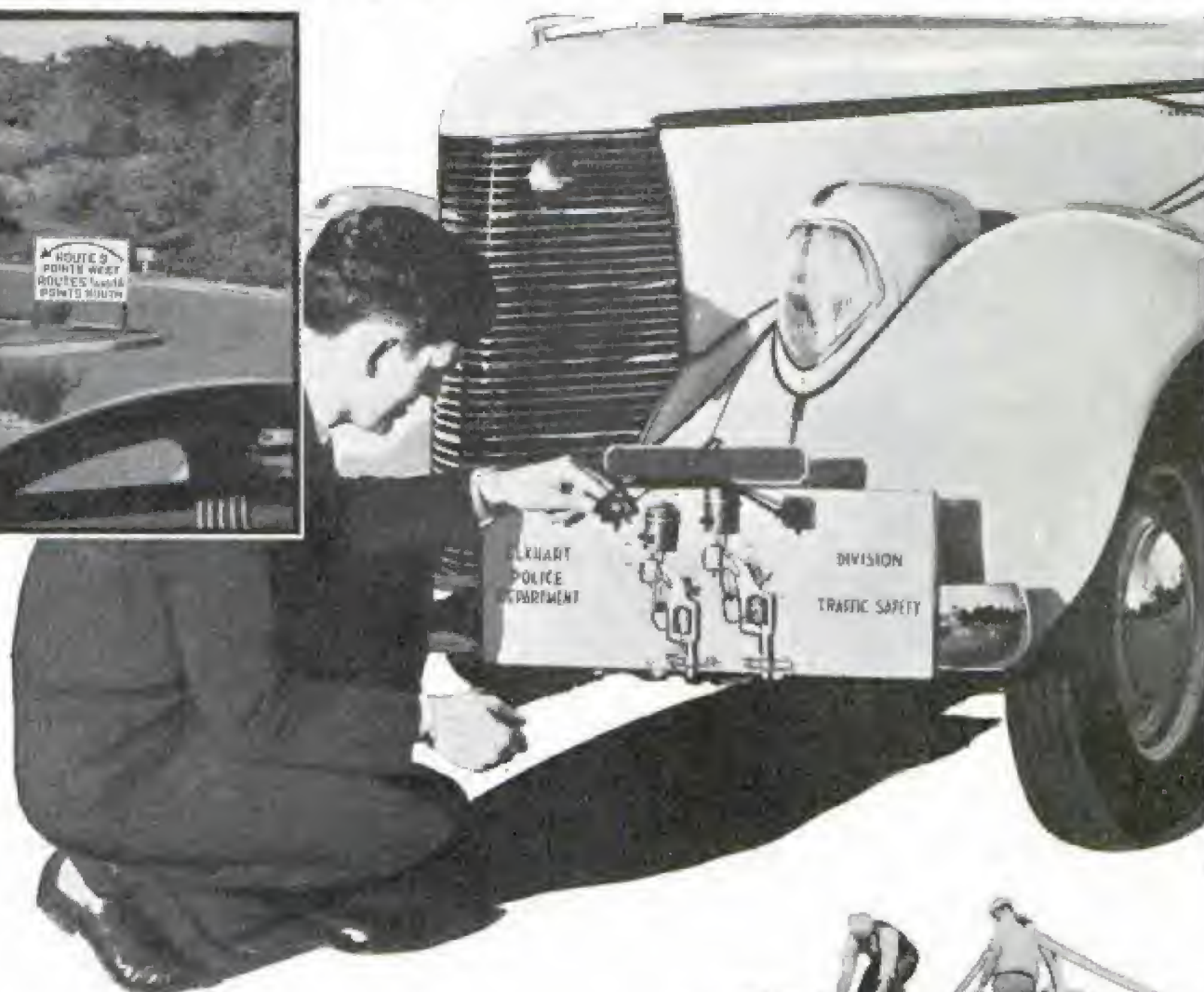
By Paul G. Hoffman

President The Automotive Safety Foundation

*366 Madison Ave*  
WHILE vast strides have been made toward reducing the rate of highway accidents, this lowered rate must be even further reduced, while more people ride more miles each year. Here is a paradox challenging the automotive industry today.



# TRAFFIC ACCIDENTS



chanics for the roads on which these automobiles operate.

Many learned American minds are deep in the work of improving our highway system. From the national capitol to the most obscure prairie county, highway directors are devising broader, safer, more useful roads and streets and these roads are being built as swiftly as money and machinery will allow. It will take scores of years to achieve the perfect national highway system, but it's on the way.

In 1908 there were registered in the United States approximately 140,000 motor vehicles. During that year they accounted for approxi-



*Top, left, eight-foot sign seen from 100 feet; right, to test brakes, one revolver fires when brakes are applied, the other when car stops. Bottom, 24,000 pounds of sandbags were piled on before steel roof gave way*





safest, strongest, most useful motor cars in the world. From the very beginning the pioneer builders and designers of motor vehicles have had the importance of safety drilled into them by grim necessity. The first vehicles built were dangerous. Mechanical failures were frequent. Fire and explosion hazard had to be reckoned with. Steering was poor. Performance consisted in merely getting the vehicle to go somehow, but to go. The passengers had little comfort or protection from the weather. A journey of 100 miles was an adventure, hazardous, fatiguing, but having all the thrills of a voyage of discovery. Today, so perfect is the control of alloy steel manufacture, so high the quality of the steel and accurate the treatment, that failures due to defective material are a minute percentage of the few mechanical failures that occur.

Perhaps in no one item has more progress been made toward safe motor cars than in body design and construction. Those who remember the motor car of, say, 1904, recall an open car with the passengers perched on top, back to back, or in a tonneau with a rear door. The windshield, when

mately 700,000,000 adventurous miles. Thirty years later, registrations of motor vehicles mounted to almost 30,000,000. These cars piled up the unbelievable total of more than 250,000,000,000 miles last year—ten times the combined travel of all other forms of transport, making automotive transportation America's biggest business, a business that is still growing. Best informed forecasters predict 500,000,000,000 miles of annual travel by 1960. Before that volume is attainable, highway builders have much work to do in expanding our highway system to make travel both more facile and safer.

One of the most noteworthy contributions to highway safety has been made by the men who build our automobiles—the



*To show punishment modern cars can take, those at left were dumped from cliff and rolled over three times, driving off under own power. Below, dividing lane prevents crossings at dangerous intersection*





there was one, was flimsily attached to the dash, the wooden structure glued and screwed together. The sedan body, perched high in the air, unstable and with no inherent structural strength, broke open like a strawberry box in a crash. Heavy hinge and door pillars, as well as thick windshield pillars, resulted in bad visibility and blind spots.

Today, the all-steel automobile is to safe highway travel what the steel Pullman is to safety in railway travel. Its ability to resist impact, to bend, or yield without breaking up is a real safeguard. Steel permits narrower door posts and hinge pillars, as well as windshield pillars, and hence gives better vision. Ventilation has been improved and the body sealed against gas fumes. Central heating and air conditioning are available.

If we could obtain a car of the vintage of 1904 or even 1915 and compare its steering with that of today, I believe most of us would allege that someone had purposely "rigged" the older model. The columns whipped about, the steering gears them-

(Continued to page 116A)



Top photo illustrates two features of up-to-date "safety mechanics"—elevated crossover and dividing strip. Below, dual controls for teaching beginners and transparent sunshade to eliminate glare

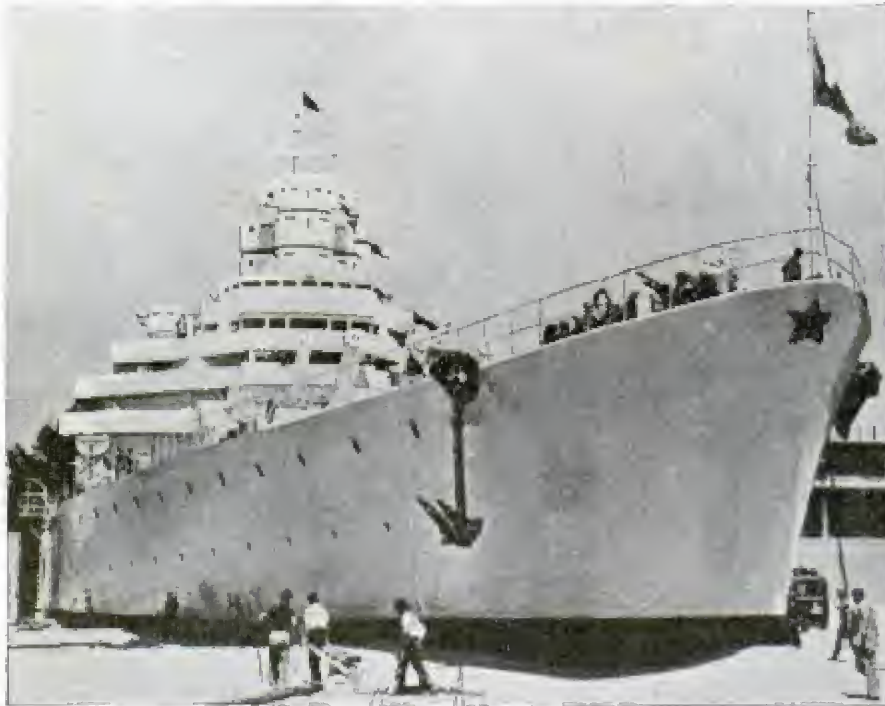
Sold by Knight. 5209

Mayberry Second Ave. Elkhart Ind.

AC-547-8/00-116A



## Dummy of Modern Warship Is Erected for Naval Festival



This life-size model of an Italian battleship, complete with armament, will never see the sea. It forms part of an inland naval festival

When the navy comes inland to conduct its festival, the most colorful feature of her array—the fleet—must be left behind. In order to add a realistic touch to such an event at a military camp in Italy, a full-size dummy battleship which never will wet her nose in the sea was built. On dry land the model serves its purpose as a faithful replica of a modern Italian warship, even to the armament.

## Bumpers Along Sides of Auto Reduce Accident Damage

To protect the sides of his new car from scratches and dents caused by sideswiping



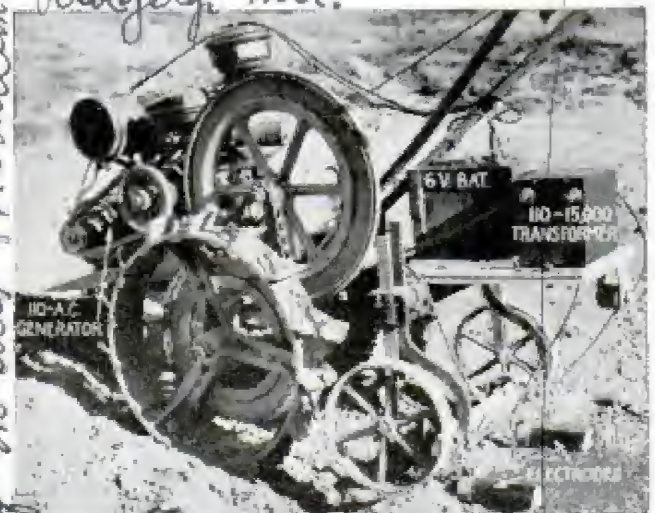
Auto completely encircled by bumpers is guarded from sideswipes as well as clashes at front and rear

other vehicles and scraping against high curbs, one owner mounted a bumper all around the running boards and fenders. Extending from the front to the rear bumper, it prevents damage to the body in minor collisions.

## Electric Fertilizer Boosts Supply of Nitrates

To increase the fertility of farm soil by multiplying the nitrogen content and stimulating the growth of bacteria, merely through application of high-tension electric current, is the hope of an inventor who has constructed an experimental machine. Laboratory tests with water having a slight trace of nitrate re-

sulted in an increase of 800 per cent. The machine consists of a storage battery, an electric generator and a transformer mounted on a small garden tractor. The generator produces an alternating current



Electric fertilizer boosts content of nitrate in soil by passing high voltage between two electrodes

of 110 volts which is stepped up to 15,000 volts by the transformer and conducted into the soil through a pair of metal-core insulators, where it is passed between two electrodes. Cultivator blades cut parallel furrows for the electrodes.



*Q. G. Peterson, manager, mechanical, Wash. D. C.*



# MODERN PRECIOUS METALS

By Dr. P. G. Worcester

Head of the Department of Geology  
University of Colorado

*Bozoider Cold*  
FOR many years, gold, silver and platinum have been regarded as the precious metals, but the picture is changing.

Gold, which commands a mint price of thirty-five dollars an ounce, is being buried in Kentucky as fast as it is mined in this country. The United States has in its vaults more than \$14,000,000,000 in idle gold. It can, therefore, hardly be called a precious metal.

Silver on the date this was written was a drug on the market at forty-four cents an ounce. The price of newly mined silver has been set, quite artificially, at sixty-six and one-half cents an ounce. Platinum, which sold a few years ago for seventy-five dollars an ounce, is down to thirty-five dollars, and is in little demand. A few essential industries require a little, but of the 200,000 ounces consumed each year by the United States, the largest user, more than



Courtesy International Nickel Co.

Testing a metal sample in a bending machine, top; tiny cracks in metal appear as large canyons under microscope. Below, nickel steel pulley used in ore separator. Attraction of magnetized pulley is enough to suspend man by hobnails of shoes

*Strong magnetic*

*Smith D. L. Milwaukee, Wis.*





*The Beryllium Corp., Reading, Pa.*

A watch made of the two alloys was once dropped 3,000 feet from an airplane. When found, it was still running; only the crystal had been broken.

Springs made of phosphor bronze break from fatigue after being flexed 300,000 times in a testing machine. Stainless-steel springs can stand 2,000,000 flexes. The engineers finally stopped the machine when a beryllium nickel spring had been flexed 15,000,000,000 times. It was still good.

Airplanes and engines, other means of transport, machine tools, electrical equipment and dozens of other fields will feel the effects of the feathery light metal. In the form of an alloy of about three parts of beryllium to one of aluminum, its resistance to wear and unusually high melting point are putting it into experimental airplane engine pistons. Not only are tremendous amounts of weight saved—and every pound saved is worth forty dollars to the owner of the plane—but it gives better

half goes into jewelry. In contrast with these metals, there are many others without which modern industrial development could not have been attained. Among them are aluminum, beryllium, chromium, nickel, molybdenum, tungsten and vanadium. These, and a few more, are really our precious metals.

Beryllium, third of the trio of light metals given to the world by science in the last fifty years—the other two being aluminum and magnesium—is one-third lighter than aluminum. In alloyed form, it has properties so remarkable as to make experienced metallurgists gasp.

Two per cent of beryllium and ninety-eight per cent of nickel form an alloy three times as strong as stainless steel. Mixed in the same proportions with copper, beryllium produces an alloy nearly twice as strong as stainless steel.

service and enables more power to be taken out of the engine.

Only a decade and a half ago beryllium's price was way over \$100 a pound. At one time it cost \$5,000 a pound—ample reason

*See Sept. 1940 325*

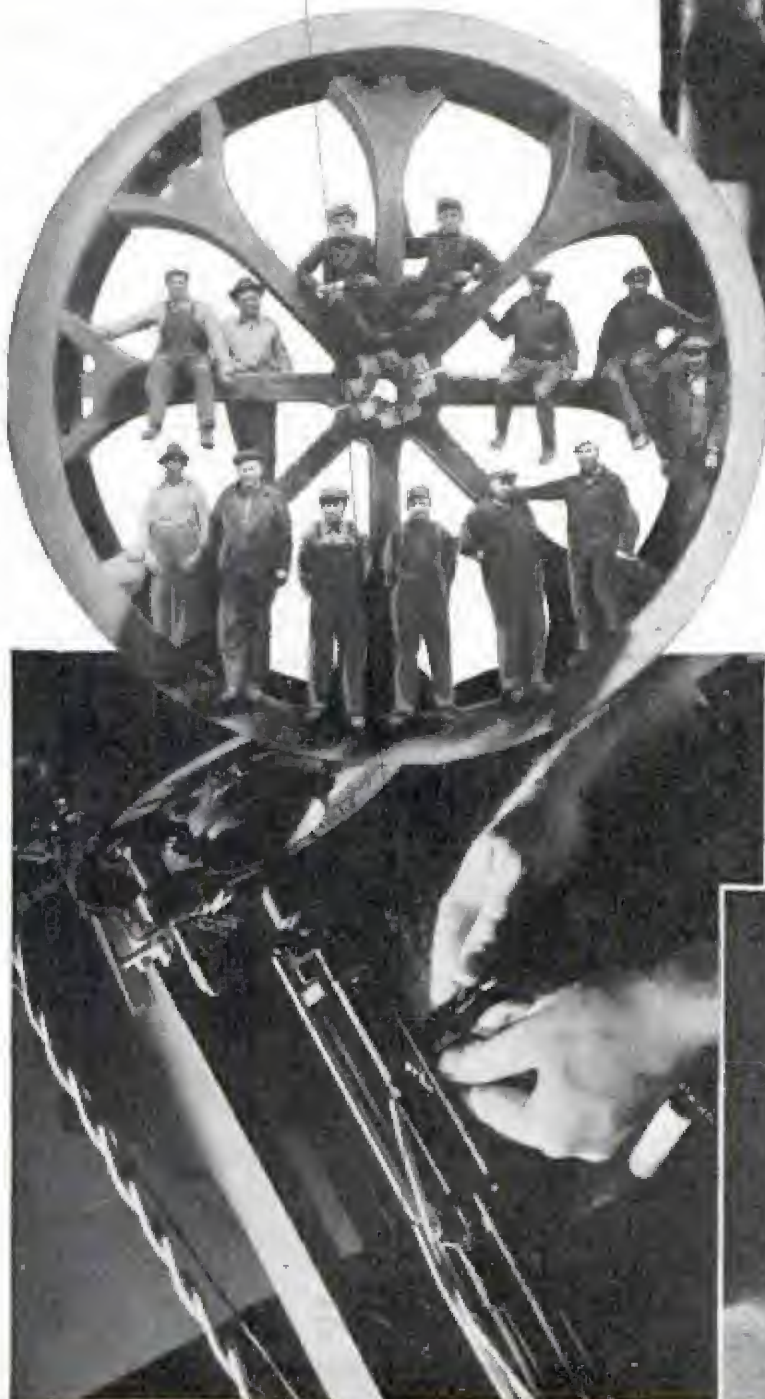


*Photoelectric cell keeps electric furnace, top, within ten points of 1,000 degrees while Westinghouse engineers measure "creep" of metals. Below, aluminum tractor in Florida swamp*

*Edw. Leonard Graebing*



why industry has neglected it all but a few of the hundred years it has been known. There is no large supply of beryllium known anywhere. It occurs chiefly as crystals in pegmatite dikes associated with quartz, orthoclase feldspar and mica. One crystal found recently in Colorado was four feet in diameter, twelve feet long and weighed eight tons. Usually it is blue or green, and when clear is in demand for costume jewelry.



Chromium is another precious metal, and most of its uses are relatively new. About 1,000,000 tons of ore containing forty-five per cent chromium were produced in the world in 1937. About fifty per cent of the chromium mined goes into metallurgy. Forty per cent is used in refractories, chiefly heat-resisting brick for open-hearth steel furnaces, and the other ten per cent is used for plating, dyes, pigments, etc. Chromium

(Continued to page 114A)

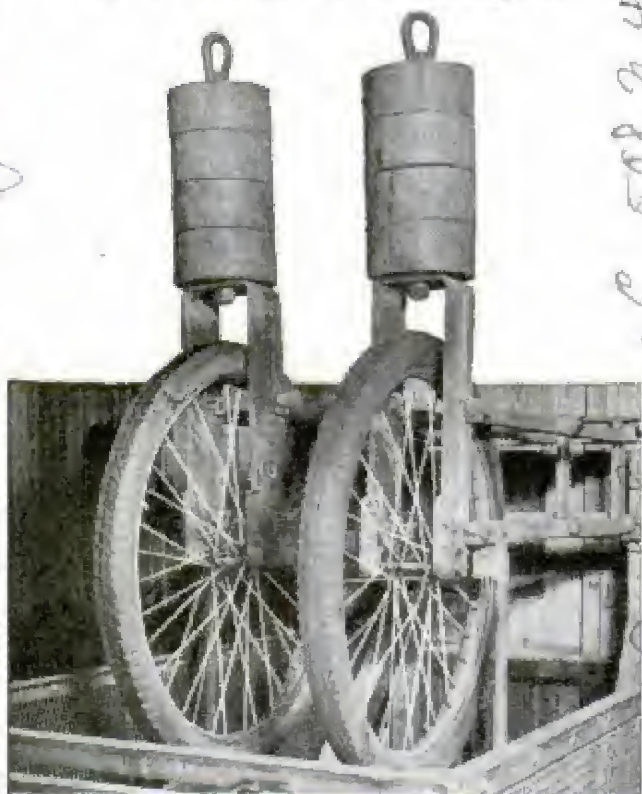


Top, starting a small spring on a "fatigue" test to determine its life span at work. Left, huge nickel cast-iron wheel with tensile strength of more than 55,000 pounds per square inch. Bottom, left, research engineer assembling thermocouples to measure the heat applied to metal test bars in "relaxation" machine. Right, typical castings of light magnesium alloy

Westinghouse



## Bike Tires Ride Treadmill in a Test of Strength



Top, stationary wheels on treadmill test; below, tires mounted on trailer for road tests behind auto

Bicycle tires, like the bigger ones used on automobiles, undergo both indoor and outdoor tests and pass through a normal life span within a few weeks' time to provide engineers with quick information about their efficiency. One manufacturer conducts road tests by mounting four tires on a trailer and placing over each tire an individual load of 125 pounds, equivalent to the weight of a large boy. An automobile then pulls the unit at a speed of twenty-five miles an hour. In order to obtain a double check, tests also are made in the laboratory on a stationary machine composed of two mounted bike tires running twenty-four hours a day against revolving

wheels with flat faces. These likewise carry 125 pounds, and spin at about twenty miles per hour. The room temperature is held at 100 degrees.

## Lawn Edger Cuts Depth Desired with Aid of Guide Wheel

Ragged edges of the lawn alongside walks or paths are trimmed neatly by a cutting tool that has a guide wheel to follow the sidewalk and also regulate the depth of the cut. The edger makes a sharp, uniform line in half the time required by older methods on straight or curved lanes. Flower beds, too, can be outlined by using a board as a guide.



## Rubber Mitt for Holding Soap Is on Flexible Standard

Housewives irked by the task of cleaning soap dishes may find an end to this problem in a holder that suspends the bar in midair where it dries out after use. The soap is placed in a perforated rubber envelope which hangs by a chain on a spring-wire standard. A rubber suction cup at the base can be attached to the smooth surface of a sink, bathtub or washbasin.



Soap holder mounted on flexible post eliminates untidy dish and conserves soap

Laral Mfg Co.  
1711 19th St. Brooklyn

Junk Tire Co. 152 W 42nd New York

Laral Mfg Co. 1711 19th St. Brooklyn





# The CRAFTSMAN

## Built-in VANITIES *open over bath*

Two pleasing designs having mirrors inside of doors and shelf space in wall—all out of the way when not in use

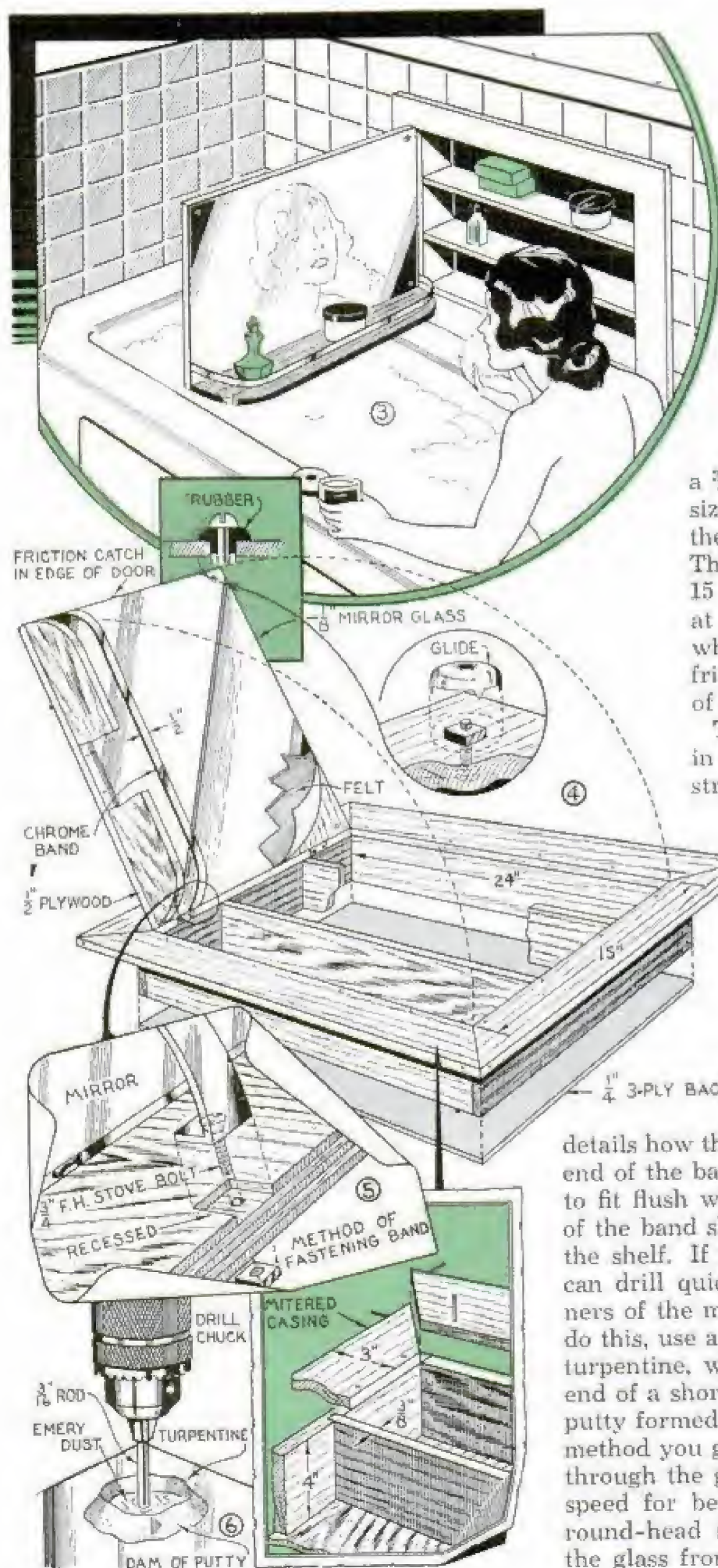
By Wayne C. Leckey

**B**BUILT right into the wall alongside the bathtub, either one of these mirror-fitted cases provides a convenient vanity with plenty of shelf space for bath salts, soaps and other toilet articles, neatly arranged within easy reach. Essentially, the job consists of fitting a boxlike frame into an opening cut between two studs in the wall.

As the cases will be finished in enamel to match the bathroom fixtures, they can be made from inexpensive plywood. The door of the case shown in Fig. 1 forms a tray when let down across the tub. When the case is closed, the hinged mirror folds compactly between the inner shelves. Begin by making the frame of the case first, Fig. 2. The  $\frac{3}{8}$ -in. shelves are nailed in grooves although you can simply use plain, butt joints. To the back of the assembled frame, a  $\frac{1}{4}$ -in. plywood panel is nailed. If a jig saw is available, you can form both the casing and the door for the frame from a single piece of plywood by carefully cutting out the center of





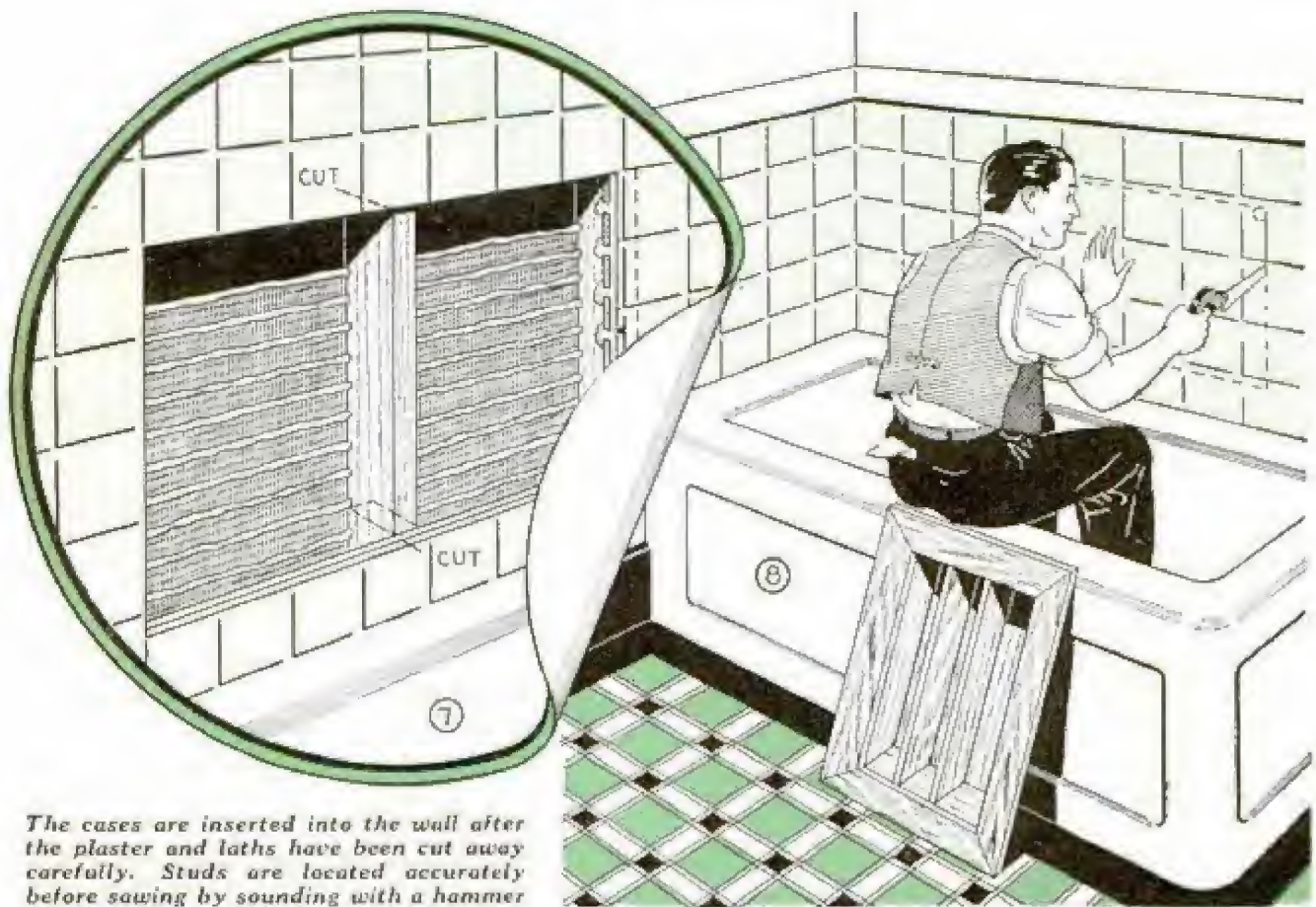


the work and using this waste piece for the door. A tiny hole in one corner of the outline permits the insertion of the blade. The edge of the door is planed a little to provide clearance for paint and hinging. A  $\frac{1}{4}$ -in. plywood panel, nailed to the front of the door, forms a recessed tray on the inside. The mirror is framed with strips of narrow, rabbeted molding, nailed to a  $\frac{3}{8}$ -in. plywood backing of a size which will fold between the center shelves of the case. The hinged edge is beveled 15 degrees so that it will lean at a slight backward angle when in use. A bullet-type friction catch in the top edge of the door keeps it closed.

The frame of the case shown in Fig. 3 is of similar construction except that the casing is mitered. Looking over the details in Fig. 4, you will see that the inside of the hinged plywood door is covered with mirror glass over a felt base. Prior to this, however, a narrow shelf is screwed to the lower edge as well as a  $\frac{1}{2}$ -in. wide metal retaining band. Fig. 5

details how the right-angle bends at each end of the band are drilled and recessed to fit flush with the surface. The curve of the band should follow the contour of the shelf. If you have a drill press you can drill quickly through the four corners of the mirror glass as in Fig. 6. To do this, use a mixture of emery dust and turpentine, which is retained under the end of a short, chucked rod by a dam of putty formed around the hole. With this method you gradually grind a clean hole through the glass. Run the drill at slow speed for best results. Nicked  $\frac{3}{16}$ -in. round-head stove bolts passed through the glass from the inside are capped on





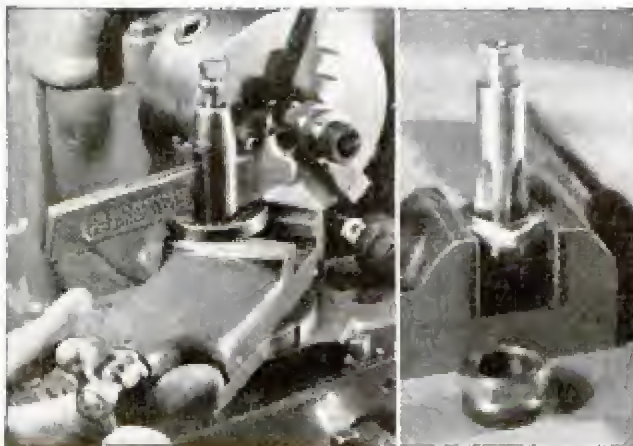
The cases are inserted into the wall after the plaster and laths have been cut away carefully. Studs are located accurately before sawing by sounding with a hammer

the face side with furniture glides pressed into the wood over the nuts. Sharpening the prongs of the glide will help. See the insert detail in Fig. 4.

The cases should be located a little toward the faucet end of the tub. No set distance can be given for the case shown in Fig. 1, as it is narrow enough to fit between two studs and consequently cannot be shifted to a given point like the alternate case, which requires a wall opening cut over a center stud because its width is greater than the usual 16-in. distance

between centers of studs. See Fig. 7. To determine the location of the studs, tap lightly on the wall with a hammer. A hollow sound will be heard everywhere except over a stud. After the stud has been located, mark the outline of the opening on the wall, taking the exact dimensions from the case itself, and drill a hole in one corner. Starting from this hole, insert a keyhole saw as shown in Fig. 8 and carefully cut out the lath and plaster. The case is fastened in the opening with nails driven through the casing.

## Odd-Size Nuts Made from Bodies of Old Spark Plugs



Large, thin or odd-shaped nuts frequently can be made from the bodies of old spark plugs. To do this, cut off the threaded portion of the plug along with the rolled flange that holds the porcelain core in place. Smooth the hexagon portion left and tap its inner surface.

—C. W. Woodson, East Aurora, N. Y.

☞ Ladies' metal or mesh bags may be cleaned by rubbing baking soda into them with a woolen cloth. The soda is removed with a brush or by shaking.



## Chicken-Roost Poles Removed to Clean Building



Amateur poultry raisers will find these chicken-roost holders a timesaver because they permit the roost poles to be removed quickly for cleaning the floor underneath them. The holders are screwed to the walls of the chicken house or to vertical support members. If round roosting poles are used, they should be flattened at the ends.

## Hack Saw Cuts Wide Sheet Metal

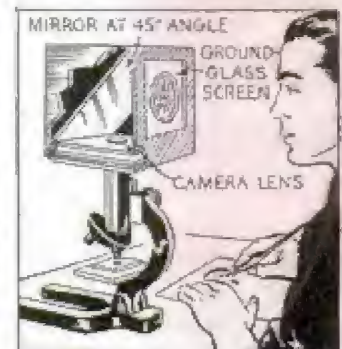
When you have a wide piece of sheet metal to cut with a hack saw, put two blades in the saw frame, spacing them so



that a cut is made wide enough to take the frame. The narrow strip of metal left by the two saw cuts is bent down out of the way as the work progresses.

## Micro-Reflector Aids in Sketching Specimens under Microscope

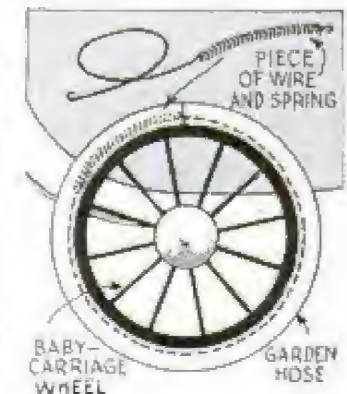
Biology students and microscope fans will find that this reflector eases eyestrain while sketching a magnified specimen, as the image of the latter is reflected on a ground glass,



making it unnecessary to look into the eyepiece of the microscope. The reflector is a light-tight box, about 3 by 4 in., containing a mirror on the inside as shown. An opening in the bottom of the box fits snugly over the microscope eyepiece, and has a camera lens at the upper end to direct the image on the mirror.

## Garden Hose Used as Tires on Baby Carriage

If the tires on a baby carriage or child's wagon are worn badly, you can replace them with tires made of lengths of garden hose. To do this, first cut a piece of hose to fit snugly around the wheel rim, then thread a piece of wire with a small coil spring attached to one end through the hose. The total length of the wire and spring should be slightly less than that of the hose so that when the tire is assembled on the wheel the wire will be under tension to hold it in place.



—S. Jarrott, Calgary, Alta., Can.

¶ You can fill scratches on furniture by dissolving beeswax in turpentine until the mixture is the consistency of molasses, then applying it with a woolen cloth.



# What you can do with PLIOFILM

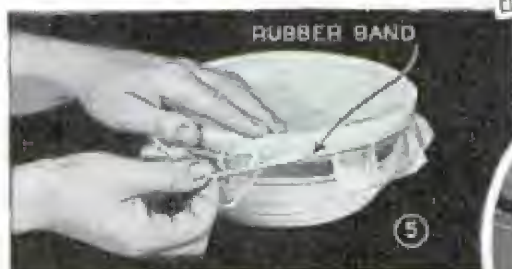
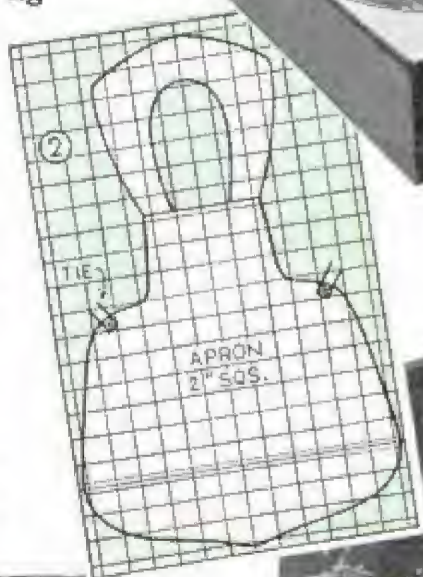
**"Welding" with a sealing iron eliminates sewing and cementing. Ideal to make Christmas gifts**

**L**OW in cost and easy to work, Pliofilm is a rubber-base sheet material available in many colors. It can be had in transparent, opaque and figured styles and comes in rolls so that you can purchase it by the yard. Most of the large department stores handle it. No sewing or cementing is necessary as joints are made by means of an electric sealing iron which can be purchased at a slight cost.

In working with this material, best results can be obtained by using a full-size paper pattern as a guide for cutting and



The use of a paper pattern assures a good fit in cutting and assembling



Bowl Covers



Making a Hem

assembling. As an example Figs. 1 and 2 show how a pattern is used in making a tea apron. Place the Pliofilm on the pattern and cut  $\frac{3}{8}$  in. outside the line to allow for hemming. Next, take the sealing iron and run it over the material,  $\frac{3}{8}$  in. in from the edge, Fig. 4, to form a crease which permits ready folding. Then, a second operation with the iron permanently seals the hem. A straightedge should be used on straight seams, but on curved edges the iron can be used freehand, as in Fig. 3. When working around sharp corners wrinkling is prevented by cutting the material as required.





is hemmed all around except those portions which are hemmed later to hold the flap in place. Rain coats and umbrella coverings, Fig. 11, are among the practical things made from Pliofilm. Suitable designs can be had at any dress-pattern service. Strips of Pliofilm wrapped around a lamp shade or bare wire frame give the novel effect seen in Fig. 12. Pulling the film lightly produces the ap-

Pliofilm makes excellent coverings, such as garment bags, bowl covers, make-up capes, vegetable bags, etc. These are formed by sealing two or more pieces together to form a bag or box to fit the article. For bowl covers, cut a circle of Pliofilm 3 in. larger than the diameter of the bowl. Fit the material over the bowl and fasten with a rubber band as in Fig. 5, then seal the Pliofilm over the rubber, Fig. 6. Let the seam cool for a minute or two before using the article.

Pliofilm is serviceable also for gift wrappings, Fig. 8, and book jackets, Figs. 7, 9 and 10. Touches of contrasting color can be obtained by adding silhouettes or initials. In making book jackets, the material

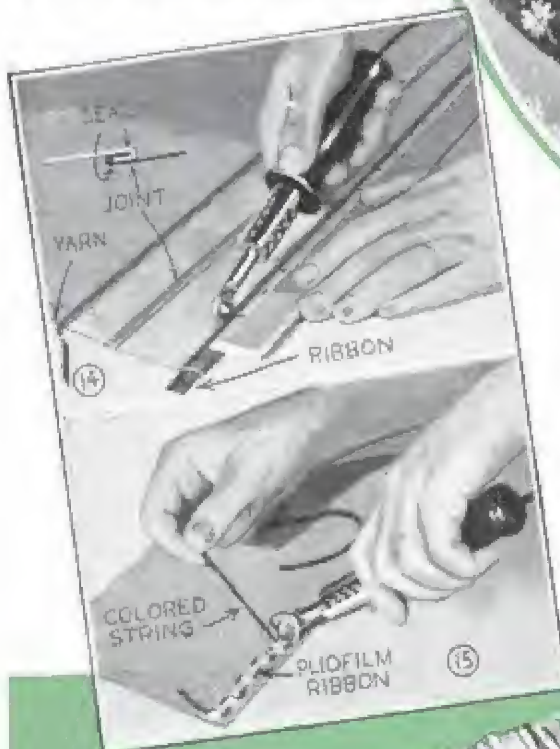
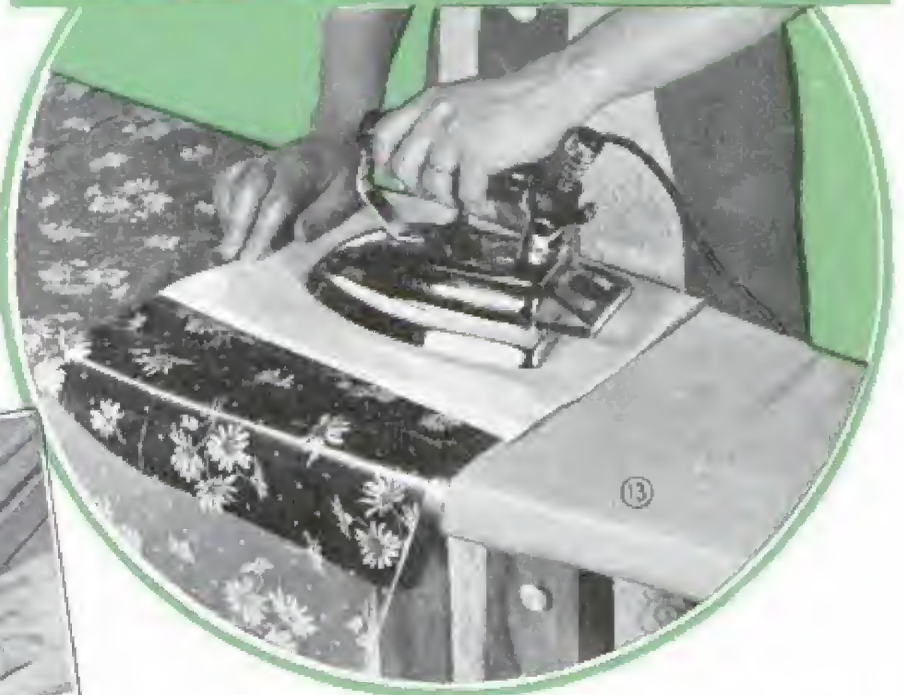






pearance of stretched silk.

Simple edge styles also improve the appearance of Pliofilm articles: Fig. 14 shows how a ribbon of the material in contrasting color can be creased in the center and sealed in place on the material. Another effect is to use colored yarn sealed inside a hem, also shown in Fig. 14. A novel border effect



is obtained by crisscrossing a ribbon of Pliofilm with a length of colored string, as in Fig. 15. Ruffles for aprons and curtains are made by cutting a strip of Pliofilm to the desired width, gathering this in the hand and sealing in place as in Fig. 16. It is sometimes desirable to use a double thickness of the material, either for strength or to secure a two-tone effect. This is done by tacking the edges together with the sealing iron, or, the sheets can be laminated by pressing with a very mild iron, as in Fig. 13. A sheet of glazed paper should be used to prevent the iron from sticking. After you become accustomed to handling the iron it will take much less time than sewing, which is an important consideration when you wish to fabricate a number of personal Christmas gifts and the time for doing this is rather limited.

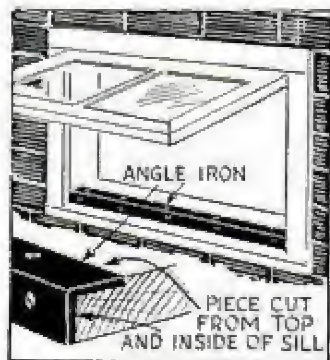


## Protecting Watch Main Spring on Cool Surfaces



Does the main spring of your watch sometimes break for no apparent reason? Perhaps the trouble is caused by removing the instrument from your pocket where it is at body temperature, and laying it on the cool surface of a dresser or table. According to a Swiss watch repairman the sudden contraction of the spring due to change in temperature is likely to break it. To avoid this trouble, insulate the watch from the surface with a tobacco pouch, thick cloth pad, piece of blotting paper or corrugated cardboard.

## Basement-Window Frame Faced with Iron to Avoid Wear



Noticing that the lower frame member of one of my basement windows was being worn by coal and other materials that were taken through it, I faced it with a length of angle iron as shown. The front edge and a portion of the top surface of the frame member were cut down so that the iron would set flush. The iron was screwed in place and the

screw heads were countersunk to avoid interfering with movement of the window sash.—John Nichols, Jr., Claymont, Del.

## Hymn Books Stored in Box under Chair

To save unnecessary handling of hymn books and to keep them collected at hand as much as possible in a Sunday School, wooden boxes large enough to hold four or five books were attached to the undersides of the teachers' chairs. After the classes assembled each Sunday, the books were passed to the various members, who returned them to the teachers as they left.



## Bottle 'Tumbling Barrel' on Lathe Cleans Small Parts

Small parts such as screws, nails, etc., can be cleaned quickly in a small bottle taped to a lathe faceplate which is rotated at the slowest speed possible. In the absence of a lathe, good results can be ob-





tained by taping the bottle to a shaft, or, as a last resort, shaking it in your hands. Put a spoonful of emery powder in the bottle with the work, and do not rotate it faster than 200 r.p.m. so that the small parts slide from end to end of the bottle as it turns.

### Concealed Knots in Child's Shoe Laces Keep Them Even

If you have trouble in keeping the shoe laces of a small child the same length at the ends, try the following: Remove the lace and thread it through the two lower eyes, pull the ends even and then knot the lace directly under each eye. Now lace it up in the regular way and the knots will keep it from slipping. If this is done carefully the knots will be concealed.

## Gay Figures Cut from Plywood Dress Up Window-Shade Pulls



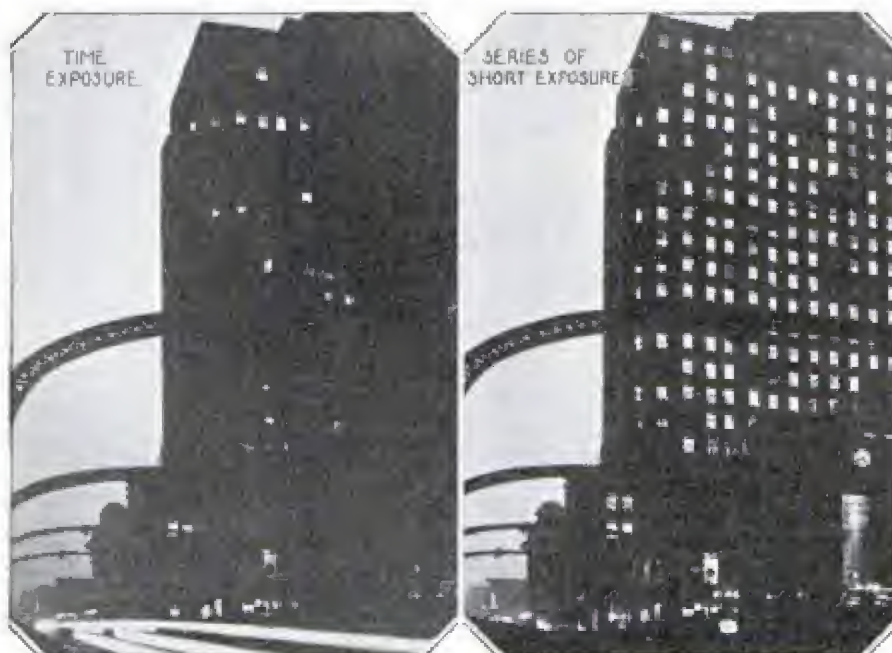
Poised in midair, these little figures provide novel shade pulls, especially for a nursery. Use gay colors harmonizing with the color scheme of the surroundings. The cords that support the pulls are also selected to match.

## Make Your Night Shots Dynamic with Multiple Exposure

Night photography is often disappointing because the lights are spotty and the

shadows too dark. Instead of making one long exposure, try setting your camera on a rigid tripod and taking a series of short exposures at convenient intervals. Time your shots so the headlights of passing automobiles are not picked up, and the ugly light streaks will be eliminated from the streets.

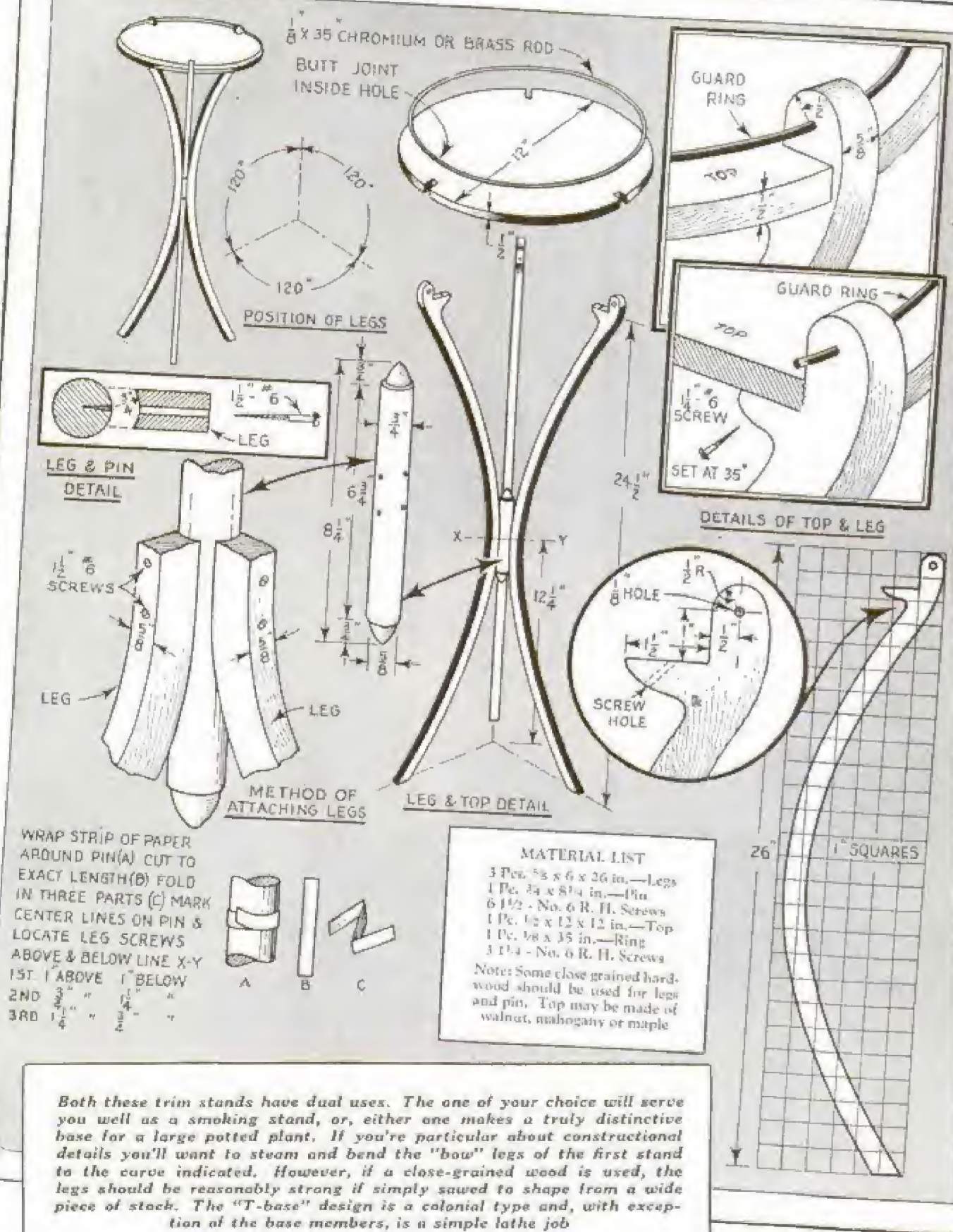
—J. G. Roberts, Chicago.



⌚ When dyeing an old garment remember that it must be cleaned thoroughly so the dye will penetrate through the cloth, otherwise it will have a streaked or spotted appearance.

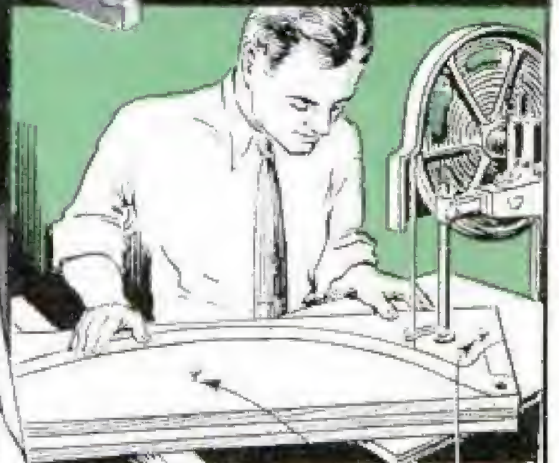


# SMOKING STANDS





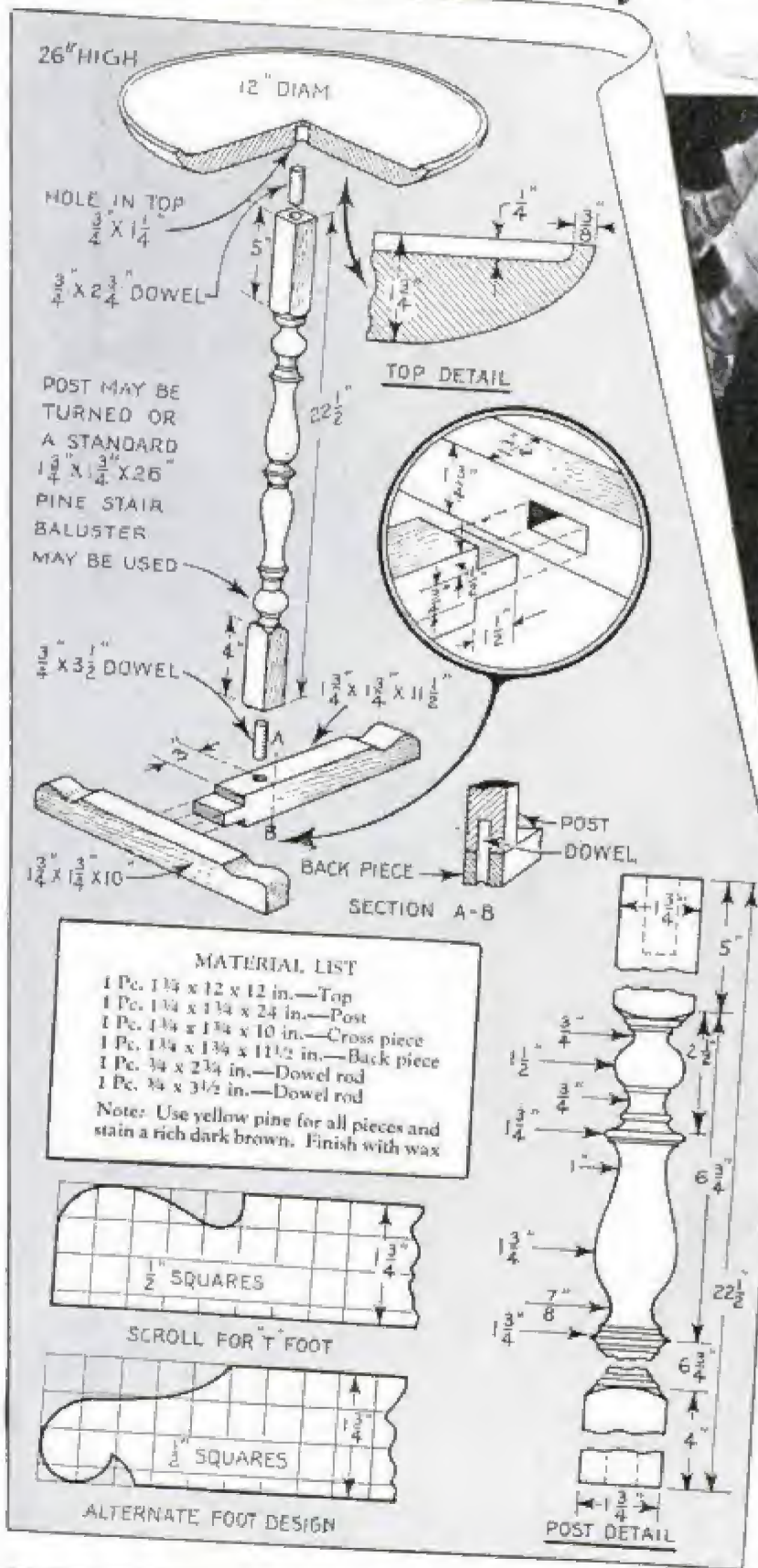
*in "bow-leg" and  
"T-base" designs*



THE THREE LEGS  
MAY BE SAWED AT  
ONE TIME



THE RECESSED TOP MAY BE FORMED  
WITH A GOUGE AND SANDPAPER





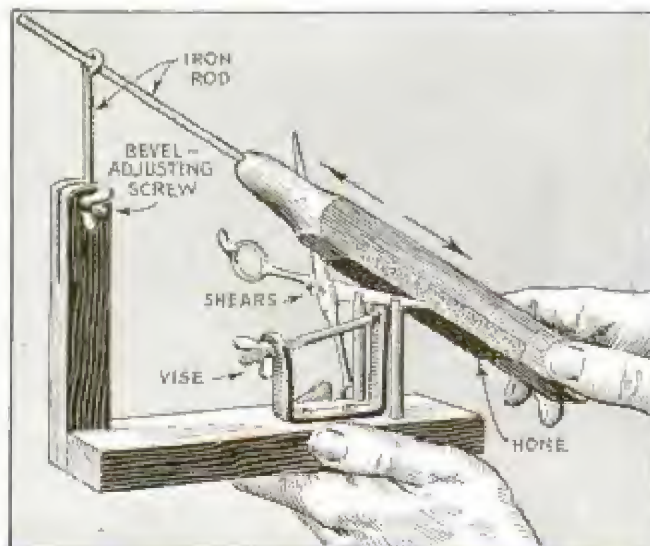
## Doorknob Serves as Paperweight and Pencil Holder



Because it holds a pencil within easy reach, a glass or China doorknob makes an especially useful paperweight. The polished knob permits easy removal of papers without marking them, and the pencil is always in a handy position to pick up.

## Scissor Sharpener Holds Hone at Correct Angle

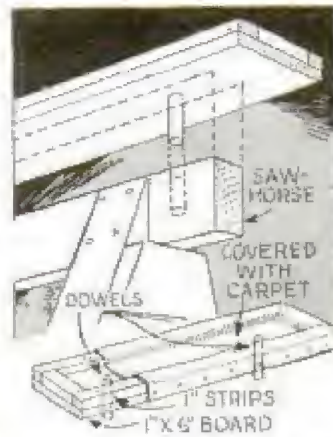
Anyone who has difficulty in honing a pair of scissors will find that this sharpener removes the guesswork. The blade of



the scissors is held rigidly at the correct angle in an improvised vise, and the angle can be adjusted as desired.

## Padded Tops Convert Sawhorses to Support Upholstering Work

The home craftsman who has an occasional job of upholstering can convert a pair of ordinary sawhorses for the work by fitting them with removable tray tops which have been padded. Large dowels projecting from the bottoms of the trays are spaced to fit in holes in the tops of the sawhorses.



## Pipe Spaced from Wall by Leather under Clamping Straps

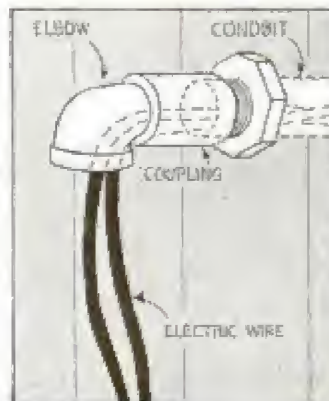


When fastening a water pipe to a wall or ceiling, it is a good idea to put strips of thick leather under the clamping straps as indicated. This spaces the pipe from the wall so

that the latter cannot be damaged by moisture condensing on the pipes, and it also makes them easier to paint.

## Elbow Guides Electric Wires into Conduit End

Before you pull electric wires into rigid conduit, screw a coupling and street elbow onto the end of the conduit. This will reduce friction where the wires enter by making them follow the turn of the elbow.







# PORKY *the* PIG



*Carved in Wood*

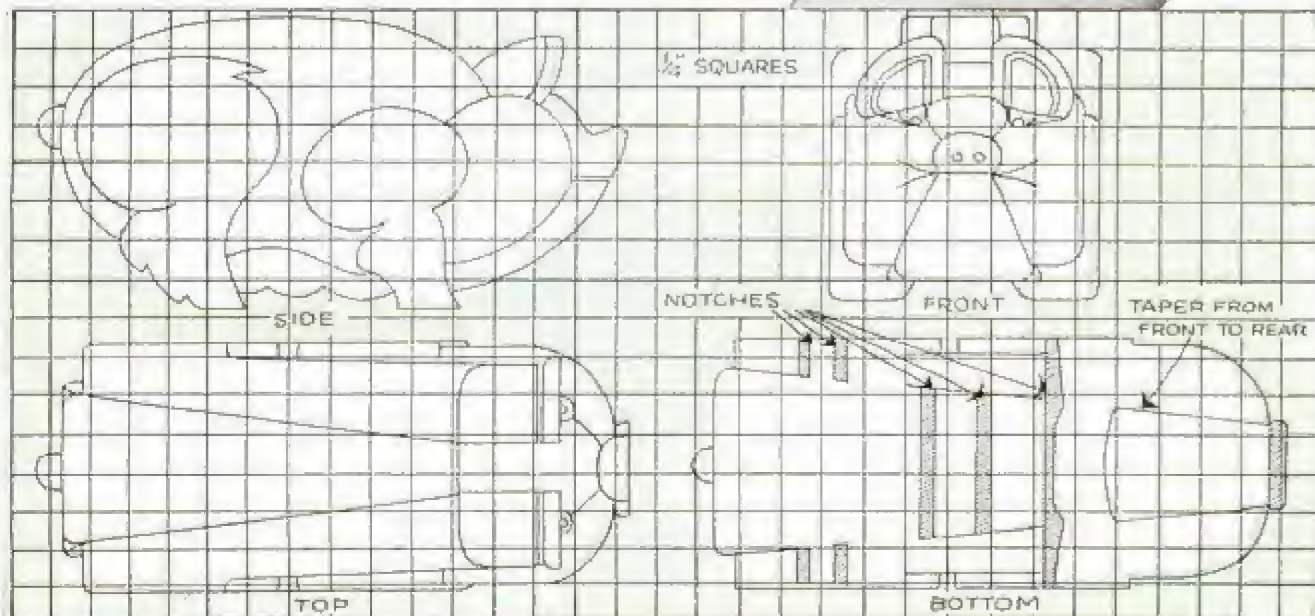


*and in Soap*

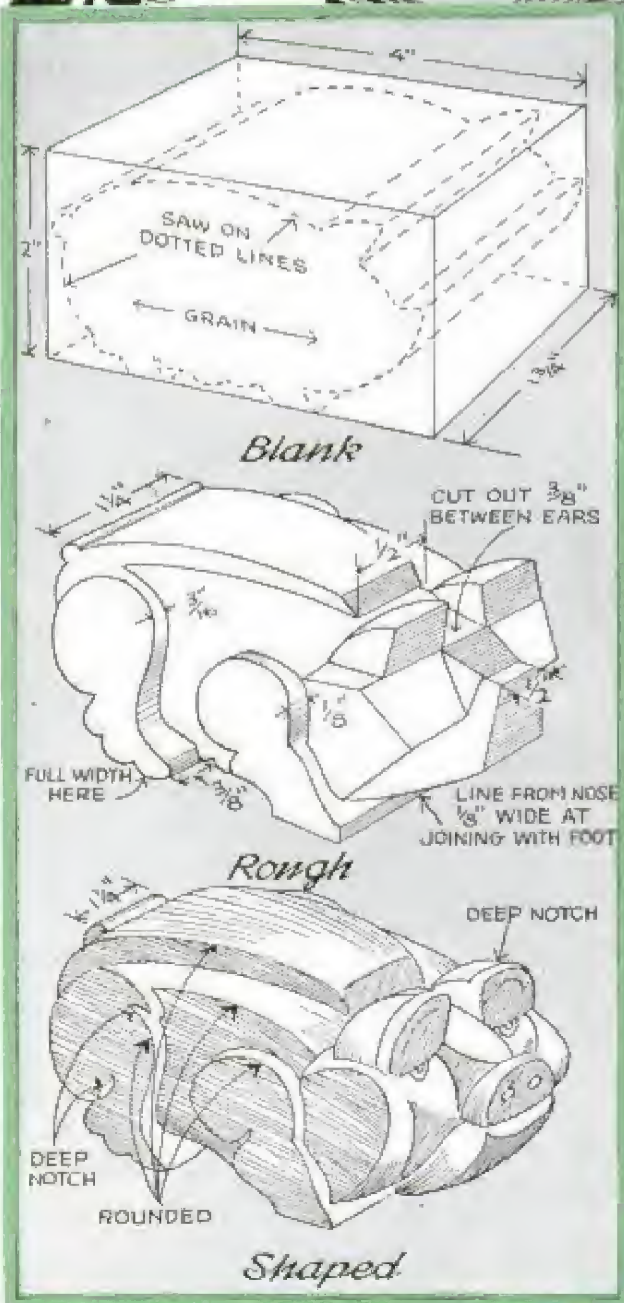
By E. J. TANGERMAN

CARVING Porky in wood or soap is an interesting pastime diversion. When done in wood, it is an easy job for those unskilled at carving because most of the work can be done on a jig saw as indicated by the dotted lines in the detail marked "blank." You will need a block  $1\frac{3}{4}$  by 2 by 4 in. with the grain running the long way. White pine or basswood is easiest to carve, but mahogany or walnut will polish up better in finishing.

Lay out  $\frac{1}{4}$ -in. squares on one side of the block and transfer the side outline to







*Porky in three stages from a rough-sawed blank to the finished form. Simple relieving cuts first, then a slight rounding to give the right characteristics*

it. Saw Porky out, outline his legs with the tip of a knife blade and whittle the wood away around them  $\frac{3}{16}$  in. deep, except for the cheek, which is cut back only  $\frac{1}{8}$  in. If the legs are properly outlined, the wood between them can be split away cleanly. Now lay out the back "hump." Note that it tapers both above and under his belly from the tail to nose. Then rough-shape the face and ears and deepen the notches at Porky's joints, rounding all the sharp lines. Note particularly the notches in the bottom view of the squared details. Ears are accented by a notch cut all around in front, and another on the side.

Porky's eyes are like half cones set in a little hollow carved with the knife point, and the nostrils are small drilled holes. His stump of a tail is only  $\frac{1}{4}$  in. square. But he looks fat enough, and happy enough to grunt, particularly if you finish him just by oiling and waxing.

### Modeling-Clay Sanding Block Smooths Moldings

One carpenter uses a piece of modeling clay as a sanding block when finishing moldings around doors and windows on the interior of a home. The clay is put inside a tobacco sack

around which the sandpaper is wrapped, and easily conforms to the contours.



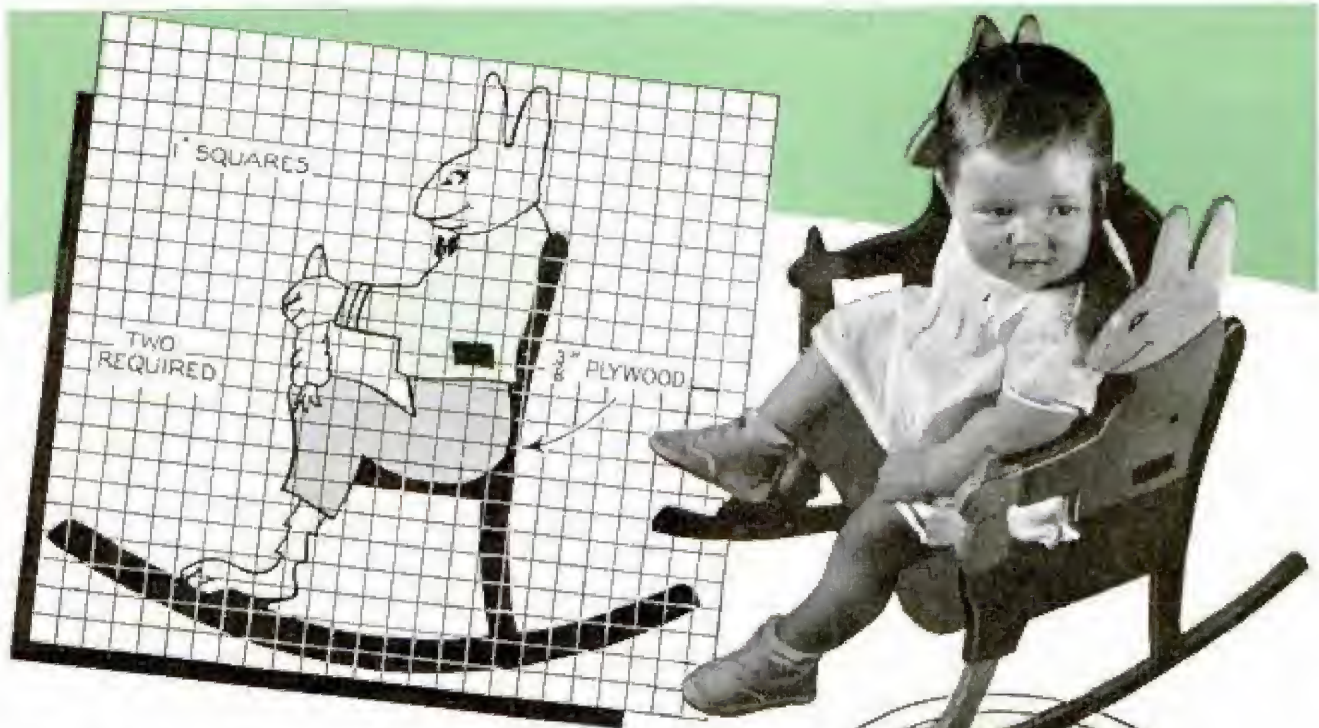
### Gaskets for Model Gas Engine

After experimenting with several materials in making a cylinder-head gasket for a model gas engine, I found that a piece of old auto cylinder-head gasket was just the thing. I cut an opening the size of the cylinder through one copper side and the asbestos center. The opening through the other copper side was made  $\frac{1}{4}$  in. smaller in diameter, after which the projecting metal was annealed and folded over the edges of the opening. Flattening and truing the gasket was done by pressing it between two hardwood blocks in a vise.

—C. L. McConnell, Alhambra, Calif.

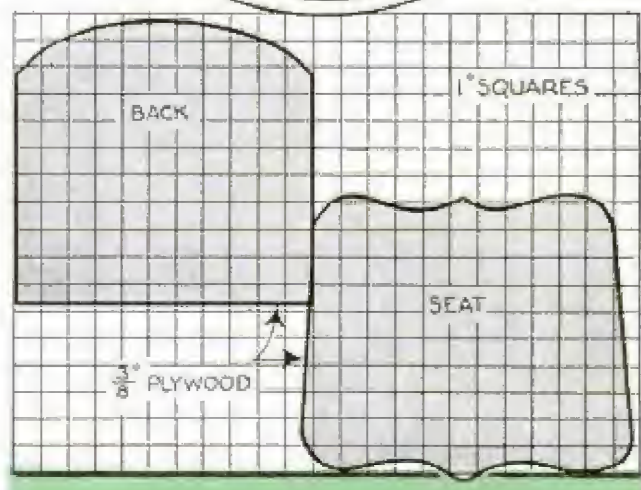


# It's Fun to Rock Between These Two Bunnies



Guarded on both sides by colorful cut-outs of Peter Rabbit, this little girl enjoys sitting in her bunny rocker. The chair is sawed from  $\frac{3}{8}$ -in. plywood and consists of four parts—a seat, back and two sides. The rockers are integral with the sides. In assembling the chair, the edges of the seat and back are butted against the sides and fastened with glue and screws spaced about 3 in. apart. Or, you can use cleats under the seat and behind the back for additional rigidity. The cleats are first screwed to the sides, then the seat and back are screwed to the cleats. Painting in bright colors enhances the appearance. First give the wood a coat of shellac and sand lightly when dry. Then finish as desired, painting the cut-outs in identical colors on both sides. The original chair had dark-blue rockers, seat and back, and the bunny cut-outs wore brown trousers and green jackets. Their faces, feet and hands were pale pink. Black neckties, jacket pockets and trouser stripes offer just the right contrast. The carrots in their hands are orange and the eyes are black with yellow pupils.

—Floyd Mix, Chicago.



❏ If your light-colored stove is badly in need of cleaning, dip a soft cloth in bleach water, then into powdered cleaner, and rub over the soiled parts. Wash with soap and water. The stove should be cold when you clean it, or the enamel may check.



## Cotter Keys Serve as Flagstaffs on Model Locomotive



If you have to replace the tiny flagstaffs on a model locomotive, cotter keys will serve the purpose nicely. Select some about the same length and diameter of the original staffs, and insert the flags between the legs of the keys, which can be slipped into the flag sockets on the model.

## Ink Bottle in Rubber-Ball Holder Does Not Tip

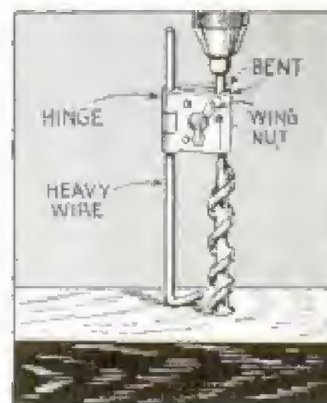
A small, hollow rubber ball cut in half and an opening made in the end to take



the neck of an ink bottle, provides a good holder to keep the latter from being tipped over. Besides supporting the bottle, the holder also tends to catch ink dripping, which can be wiped off easily.

## Hinge Clamped to Auger Bit Provides Depth Gauge

Made from a butt hinge, this depth gauge can be clamped quickly to the shank of almost any auger bit. The ends of the hinge leaves are bent slightly inward and a piece of heavy wire replaces the original hinge pin, as shown. Tightening a wing nut, which is fitted to a bolt passing through the hinge, locks the adjustment and clamps the gauge securely to the bit.



## Fish Line Waxed Easily



The next time your fish line needs waxing, get a small tin can and punch holes in the opposite sides of it for two corks as shown. Melt enough wax to come up over the corks and then thread the line on a darning needle and push it through the corks. Pulling the line through the melted wax slowly will impregnate every fiber and the second cork squeezes out all surplus wax.

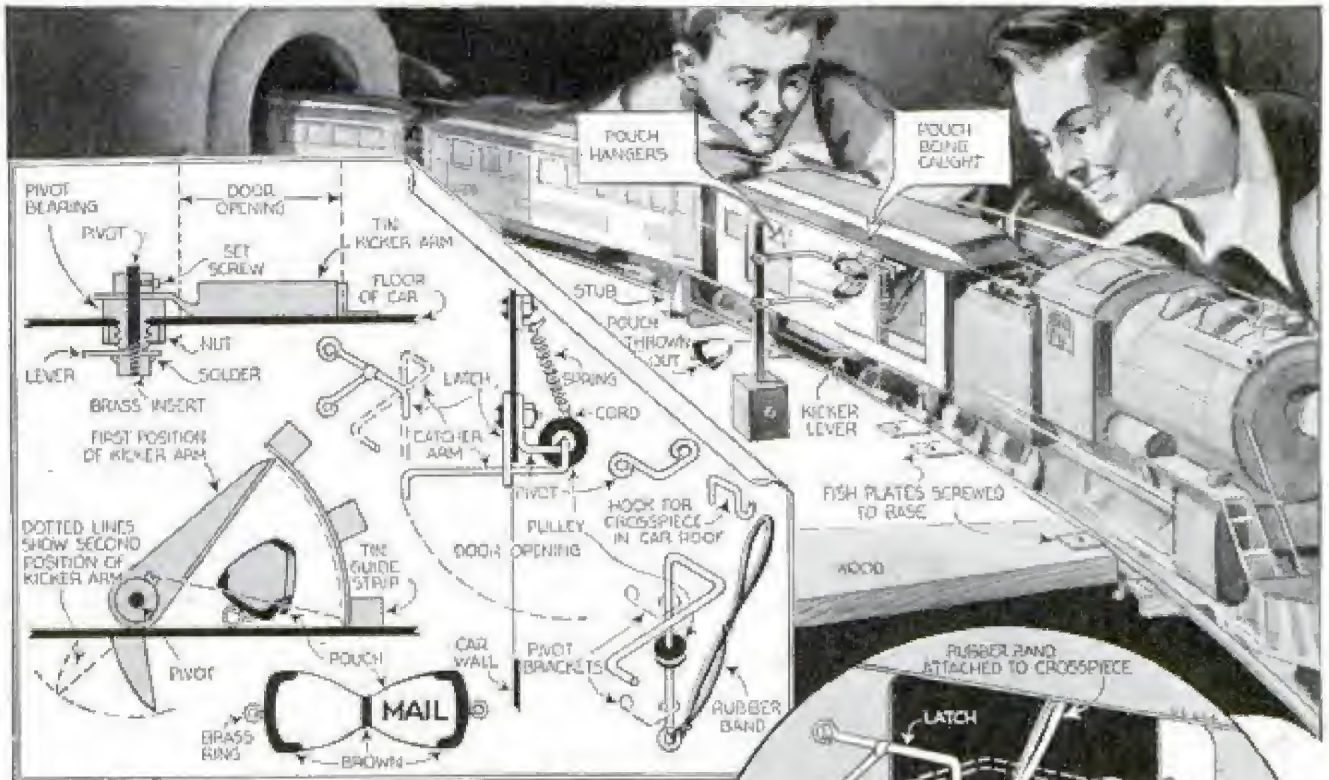
## Sinker Anchors Tape Measure

Instead of using a knife or nail to hold one end of a tape line when measuring logs, boards and other long work, a lumberman attaches a lead fish-line sinker as shown.





# Mail-Pouch Catcher Gives Realistic Action



**T**HIS midget catcher kicks one mail pouch from the car door onto the station platform, then catches the second pouch from the hanger and swings it inside the car in the same fashion as its full-size counterpart. A close look at the details gives you the idea of how it works. First is the installation of the kicker arm which throws the pouch out the car door. This is a tin angle swinging on a pivot installed just inside the door in the manner shown. A curved guide strip is soldered to the floor of the car to hold the pouch in the proper position. A stub or lug soldered to the track engages a lever attached to the kicker pivot to actuate the arm. No dimensions are given on these parts because you have to make them to fit the car in hand. The catcher is really a separate unit supported on two pivot brackets of bent wire attached to the side of the car. The arm and latch are also bent from wire to the shape indicated. A tiny sheave, made from two sheet-metal disks and a small housing, is soldered to the arm. One end of a light cord wound around the sheave several turns is attached to a return spring as you see it in the details. Now, when you have the arrangement assembled as shown in the circle above, make sure that it works freely without binding at any point.

The mail pouch is loaded with small lead shot and when caught by the arm its weight is sufficient to pull the arm down slightly, releasing it from the latch. Then the coil spring, attached to the sheave and the car wall, pulls the arm inside the door as indicated by the dotted lines. When the pouch is removed and the arm swung back to position, the tension of the rubber band shown holds the arm under the latch. Some experiment will be necessary to get the hanger located in the proper position on the platform. Of course, the latter must be attached to the track so that it does not shift and throw the hanger out of line.

Ⓢtair carpet will last longer and wear more evenly if you purchase it half a yard too long, and fold it in at the top and bottom of the stairs; as the carpet wears on the edges of the treads, move it a trifle.



Sal. Sacramento  
064

# LIQUID



Here the rubber mold formed over model is removed

Fun and profit in casting colored jewelry, buttons, statuary and novelties of all sorts that are practically unbreakable and noninflammable. You reproduce objects by a simple process of forming a flexible rubber mold which is poured full of liquid plastic and is heated in an oven at about 165° F. No expert knowledge is required to do this work—anyone becomes adept with very little practice. Liquid rubber, plaster of paris, some modeling clay, liquid plastic and a dollar oven are all you need to start with this fascinating craftwork

By R. STEWART



Some of the articles you can form in rubber molds with a kit costing a dollar

ANYONE can make innumerable small objects of tough, resilient plastic, which is available in liquid state and hardens quickly when heated. The user merely pours the liquid into a mold, which he can also form by a simplified process. While metal and plaster molds can be used, the simplicity of making and using rubber molds favors the latter. All you need to start in this fascinating work is some special liquid rubber and the plastic. The latter consists of two separate liquids, nine

parts synthetic resin and one part catalyst. Colors can be had by adding ordinary plastic dyes to the resin before mixing it. If desired to experiment on a small scale, a small amount of the material will provide lots of fun and will give you first-hand information on using it before purchasing larger quantities for more extensive work.

The preparation of the mold is the biggest part of the job. Step-by-step information on doing this starts with Fig. 2. After selecting the model to reproduce,

1098 bearing of  
the bearing  
2215



Liquid Rubber.

suggest do-to works. Sept 2-827  
Cincinnati, Ohio

# PLASTICS

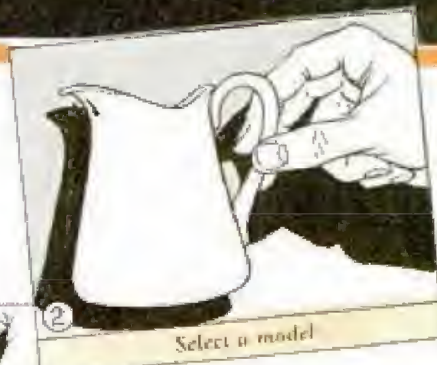
## Open New Field in Craftwork



After experimenting with the simpler articles, more ambitious novelties like these can be made

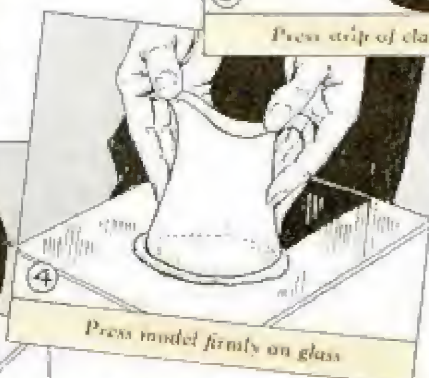
such as the creamer for example, you take a wad of ordinary modeling clay, roll it in the hands or on a piece of glass to form a strip, which is pressed to the bottom, near the edge, Fig. 3, so that the creamer can be stuck firmly onto a sheet of glass as shown in Fig. 4. After pressing the creamer down firmly, some of the clay may ooze from under the bottom and this is trimmed off close to the creamer edge with a sharp knife as in Fig. 5. Now, throughout the process of forming the mold, creamer and piece of glass are not to be separated.

If there are any openings in the model that must be repro-



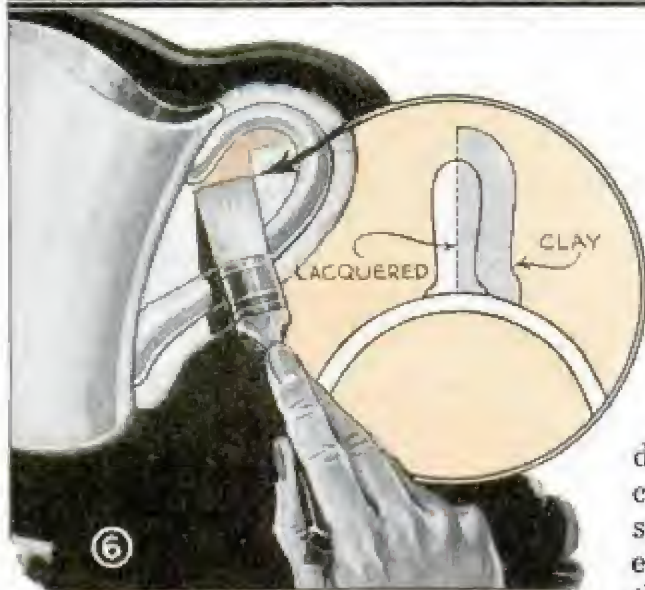
duced, in this case the opening of the handle, a separator must be provided so that the completed rubber mold will be split at this point, permitting removal of the model.

To form the separator, press a wad of modeling clay on one side of the handle, letting it extend halfway inside of the handle as indicated in the detail of Fig. 6. Then ordinary brushing lacquer is applied against the clay dam to contact the inside edge of the handle. Several coats of the brushing lacquer are needed in order to build up the thickness of the separator to assure its being sufficiently strong.





# LIQUID RUBBER BRUSHED ON MODEL FORMS MOLD



⑥ Openings filled with lacquer separators



⑦ Apply several coats of liquid rubber

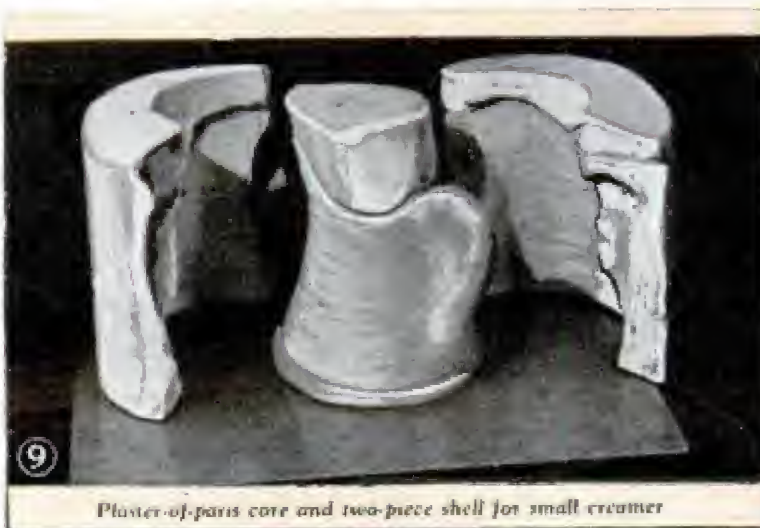
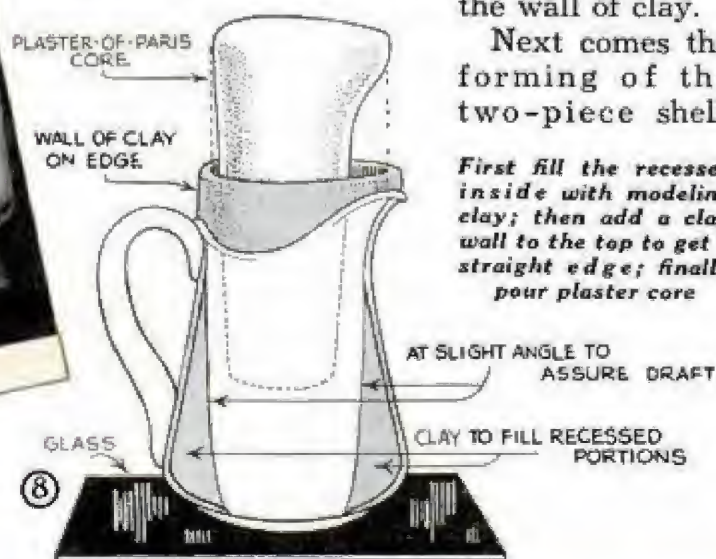
Next comes the actual formation of the rubber mold. Liquid rubber is brushed over the entire surface of the model, inside and out, as in Fig. 7. After the first coat has dried, apply another and continue with still more coatings, allowing each coat to dry before the next is added, until a thickness of  $\frac{1}{16}$  to  $\frac{1}{8}$  in. has been built up. Now set the whole thing away for several days to permit the rubber to cure.

When you come back to the job after this intermission, you are ready to make a plaster-of-paris

shell, which is used to hold the flexible rubber mold while pouring the plastic, after the original model has been removed. However, the model is still kept in the mold throughout the entire process of forming the shell. On flat models without undercuts a one-piece shell can be made, but in case of the creamer it is necessary to provide a core and a two-piece shell as shown in Fig. 9. Fig. 8 illustrates how the core or the inside shell of the mold is produced. First apply modeling clay to fill recessed portions so that the diameter of the space at the bottom will be less than the diameter at the top. This assures easy withdrawal of the plaster core. On the irregular top edge of the creamer a thin wall of clay is also added to produce a horizontal edge as indicated in Fig. 8. After this has been done, you grease the rubber surface with olive oil and then fill with plaster of paris up to the edge of the wall of clay. When the plaster has hardened, remove the wall of clay.

Next comes the forming of the two-piece shell,

*First fill the recesses inside with modeling clay; then add a clay wall to the top to get a straight edge; finally pour plaster core*



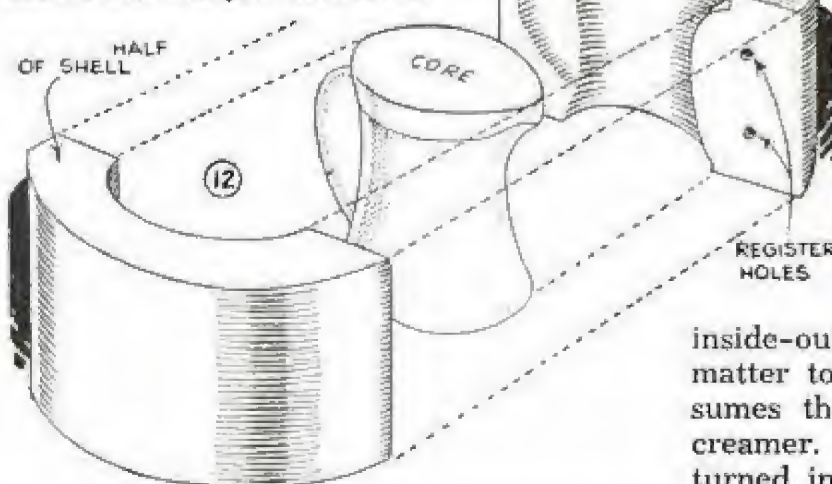
⑨ Plaster-of-paris core and two-piece shell for small creamer



# PLASTER CORE AND SHELL HOLD MOLD WHILE POURING

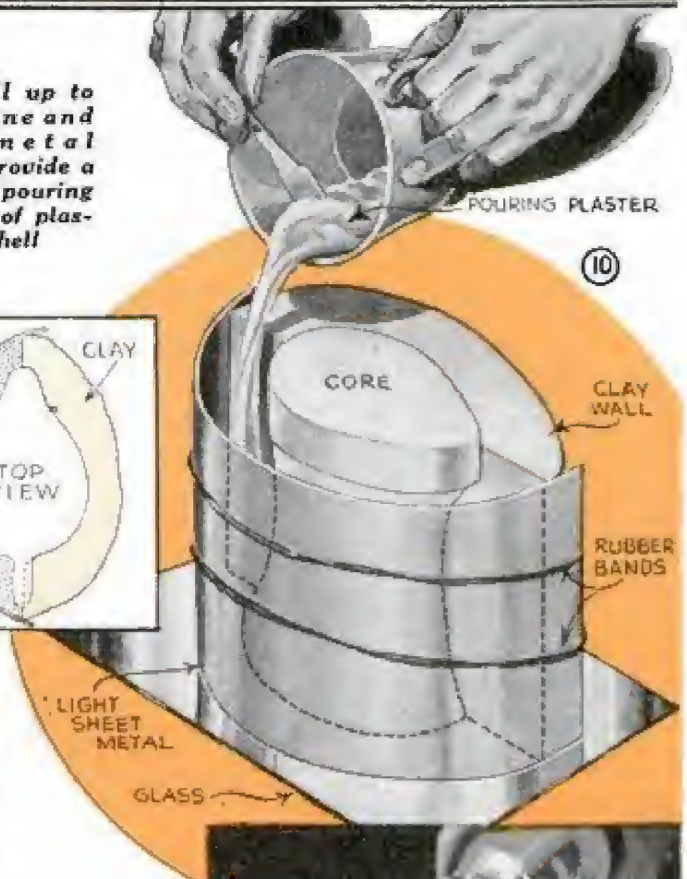
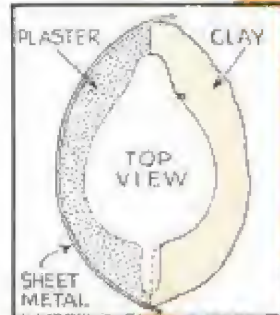
illustrated in Figs. 10 and 12. Remember that the model is still being held on the glass while you are forming the shell. A piece of light sheet metal is bent to a curve around the exposed part of the mold, with clearance of about an inch for pouring plaster. Note that the ends of the sheet metal fit against the clay dam and that rubber bands slipped over the whole assembly hold it together while pouring. Before pouring, both the rubber which is exposed and the exposed portion of the core are greased thoroughly with olive oil and four small register holes are pressed into the clay dam. Then the plaster is poured. When hard, the clay dam is removed and the tin transferred to the other side to repeat the operation, not neglecting to grease again all rubber and plaster surfaces against which plaster is to be poured, in order to permit easy separation.

*Punch register holes in first half of shell, assemble with model, grease surfaces, then set up with sheet-metal shield and pour second half*



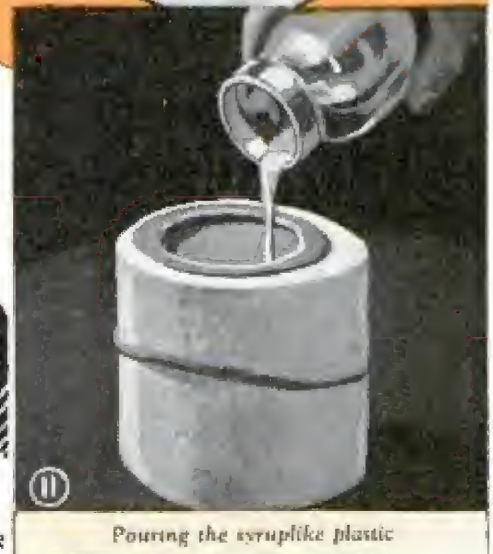
With the job of making the mold and the stiffening shell completed you are now ready for pouring the plastic. All that is necessary is to remove the glass from the bottom of the creamer, and pull off the flexible rubber mold from the creamer as shown in Fig. 1. The rubber will be tough and you can stretch it as required in order to remove the model. The mold may turn

*Clay wall up to parting line and sheet-metal shield provide a form for pouring first half of plaster shell*



HALF OF SHELL

REGISTER HOLES



Pouring the syruplike plastic

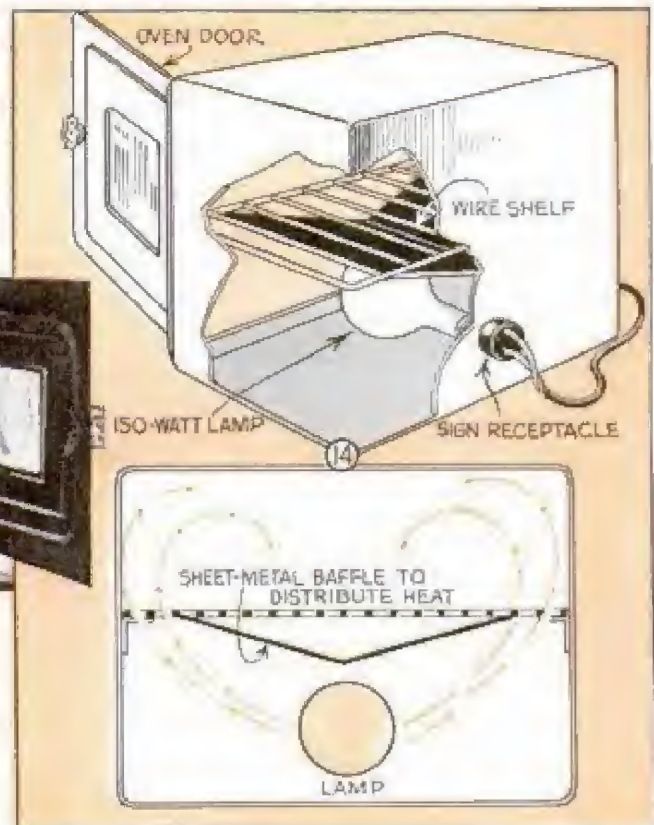
inside-out when doing this, but it's an easy matter to reverse it again so that it assumes the same position it had on the creamer. In fact, the mold should be turned inside-out so that you can apply fine talcum powder to its inner surface, which assures easy parting of the plastic. Then the mold is placed in the shell, which it fits exactly, the core is inserted and the whole assembly is set upside-down for pouring, as shown in Fig. 11.

After the mold has been filled with liquid plastic, the assembly is placed in an oven for 20 to 30 min., where the temperature is kept from 160 to 175° F. The liquid





After pouring the plastic, it is slowly hardened by heating at 160 to 175° F., in a small oven, heated by a 150-watt electric lamp



will change to a milky white solid plastic. An inexpensive oven like the one shown in Fig. 13 can be constructed by mounting a 150-watt lamp inside a small gas-burner oven, which sells for a dollar, or in a small box provided with a door. In order to distribute the heat from the lamp uniformly, you can provide a sheet-metal baffle wired under the oven shelf, as in Fig. 14.

Rubber molds once made can be used over and over again to make duplicate articles of plastic. Often the plastic repro-

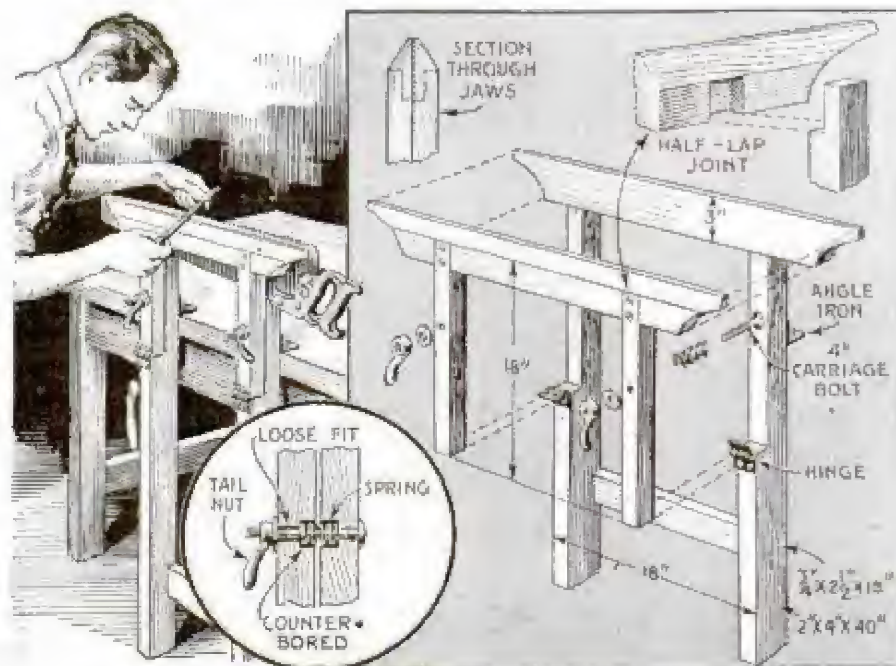
duction requires no finishing whatever, especially those produced from glass or porcelain models. However, the material can be polished on a buffing wheel or in a tumbling barrel. It can be cut and sawed but is almost unbreakable in daily use.

## Saw Vise Has Long Jaws Opened by Pressure Springs

Once you have clamped a hand saw between the long jaws of this sturdy vise, you can complete a job of filing the teeth

without stopping to shift the blade. The vertical members of the vise are 2 by 4-in. stock ripped in half 20 in. down the center

and joined together at the bottom with a stretcher notched flush in the edges. The jaws, shaped and beveled as shown, are notched on the face side to take the half-lap upper ends of the vertical members. After boring and counterboring each cut-out piece to take a short coil spring and bolt, they are hinged in place as indicated. When the tail nuts, fitted to the  $\frac{3}{8}$ -in. carriage bolts, are loosened the springs force the jaws apart, making it convenient to insert or remove the work.





## Personalize Your Tie Rack with a Photograph



Using enlargements of favorite photos, you can make these tie racks for yourself, and they will be appreciated as gifts by your friends. A photo of the head and shoulders is glued to  $\frac{1}{4}$ -in. plywood and then cut out with a jig saw. When finished, the photo should be about 7 in. high. If desired, silhouettes can be substituted for

photos. In this case, the outline of a photo is traced directly on the wood, which is then sawed to shape and painted black. The rack for the ties is a block of  $\frac{3}{4}$ -in. hardwood cut as shown and screwed to the plywood back near the lower edge. L-hooks to hold the ties are then driven into the edge of the hardwood piece.

## Pedestal Bird Bath of Concrete Resembles a Tree Trunk

The home owner who wants to try his hand at making novel articles of concrete will find this bird bath a useful as well as a decorative article. Simulating a hollowed ring cut from a tree trunk and nested between four stub branches, the bath is a single concrete unit formed by applying cement to a framework of metal lath. The serrated lines imitating bark were scratched in the surface of the concrete before it hardened. The water receptacle was formed over a sheet-metal disk with metal lath bound around the edges, the disk being set on top of the main framework so that the entire assembly was formed into a single unit as the cement was applied. The bath was built on a concrete platform large enough to keep it from tipping.



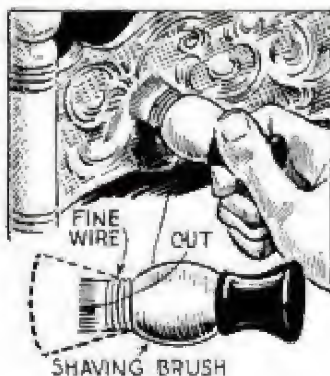


## Toy Balloon Coated with Rosin Is Halloween Noise Maker



Safe and effective, this noise maker is simply an inflated rubber balloon sprinkled with powdered rosin. When this is rubbed against a windowpane it will produce noise without danger of breaking the glass.

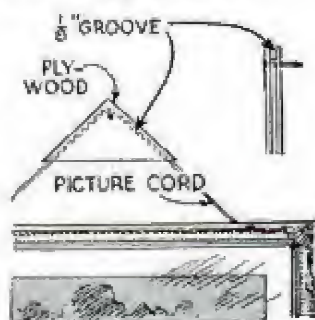
## Shaving Brush Helps in Rubbing Intricately Carved Work



You will find a cheap shaving brush with the bristles cut off, as shown, a timesaver when rubbing carved work with pumice or rottenstone. Bind the bristles with wire before cutting.

## Pictures Suspended from Block to Avoid Breaking Cord

Cords supporting heavy pictures are less likely to chafe against the nail or hook and break, if triangular blocks are pivoted to the nails and the cords



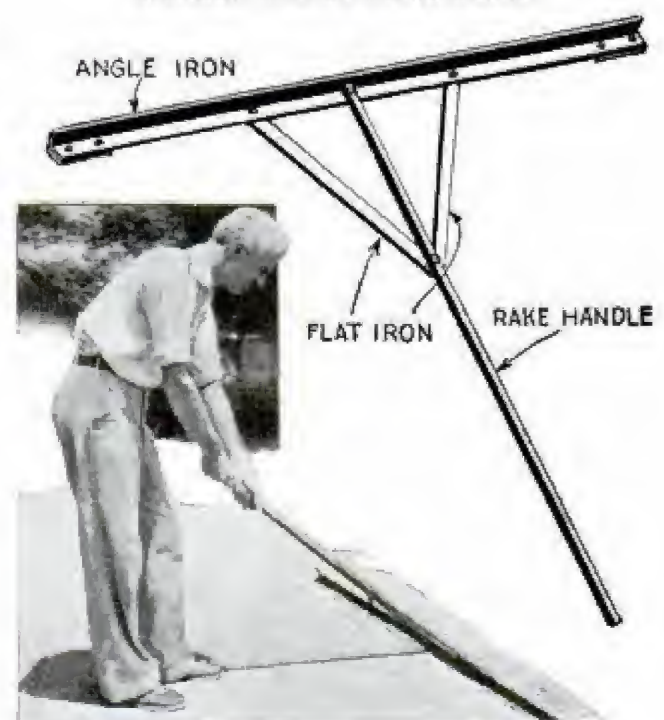
placed in grooves cut in two edges of the blocks. Also, greater friction between the cords and blocks helps to prevent the pictures from tipping toward one side if the pivot holes in the blocks are located at the balanced center.

## Developing Tray Partitioned to Save Fluid

You can economize on developing fluid when finishing small negatives and prints if you partition the developing tray so that one-half of it can be used. This is done with a strip of thin wood coated with asphaltum varnish. It is fastened in place with rubber cement, flowing it liberally along the joint.



## Scraper for Croquet Court Made from Bed Rail



The side rail of an old iron bed or any piece of heavy angle iron makes a handy scraper for dirt croquet courts, when fitted with a wooden handle braced as shown. The weight of the bar makes a smooth surface without bearing down on the handle.



# VALET

## A Man's Clothes Rack

Besides accommodating daytime wearing apparel neatly, this rack holds a bathrobe full length, as the hanger support is adjustable. A handy shelf for watch, alarm clock, keys and other small items is also included. While the rounded edges can be formed by hand tools and sanding, a uniformly accurate job in this respect is preferably done on a shaper. The heavier piece of the main upright is grooved to take the sliding post and the half-lap joint on the hanger should be cut before the lower edge of the hanger is sawed to shape



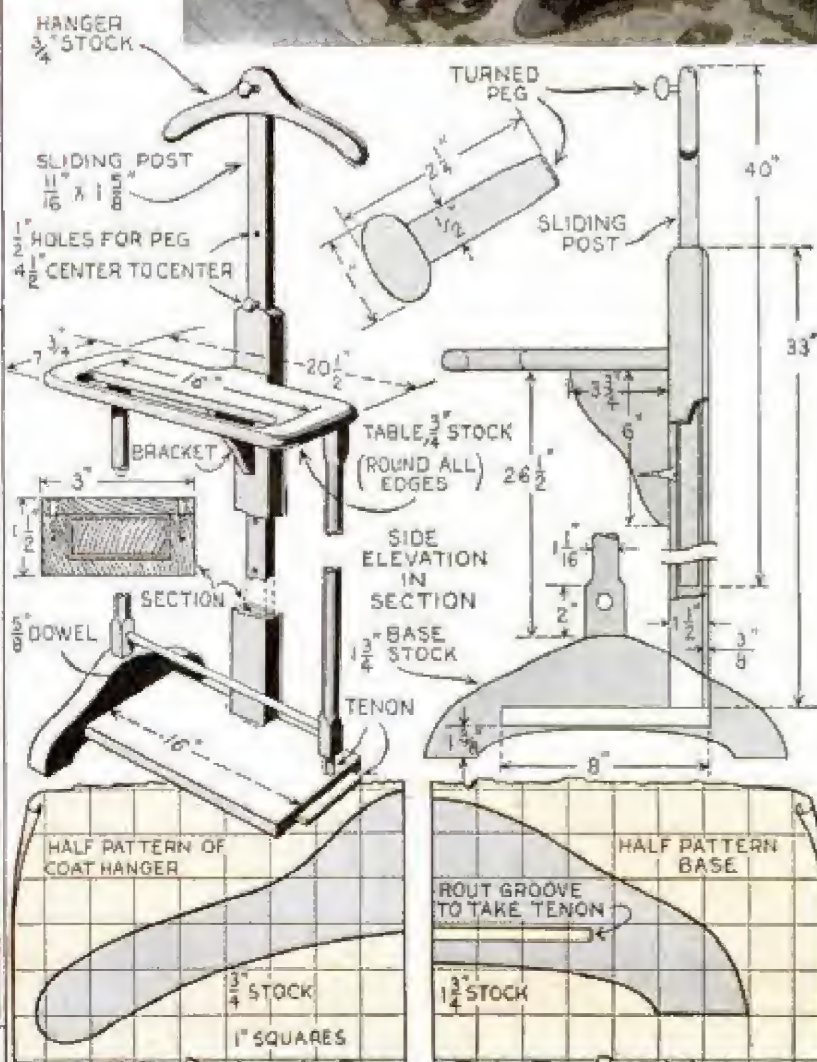
Rounding edges of table



Cutting half-lap joint (coat hanger)



The bracket is screwed in place





*Thompson  
Sawmill  
Armed  
Man*

# From SPRINGS to



SIMPLE and inexpensive, the loose spring cushion is often the only upholstering necessary to complete an attractive chair. For inner-spring construction, purchase a spring mat of the required size. The equipment necessary to make a cushion is shown in the material list, and in

Fig. 1. Arrange the cardboard box as shown in Fig. 2, bradding it lightly to the workbench and driving nails at either end to hold the sides vertical.

Place a layer of cotton in the box and lay the spring mat over it as in Fig. 3. Fold the cotton over the spring and add a second layer, Fig. 4. Then close the box and tape it shut, Fig. 5. Strip the casing over the box, as in Fig. 6, and use the wooden plunger in Fig. 1 to ram the filling into the casing, at the same time withdrawing the cardboard box, as shown in

## MATERIALS

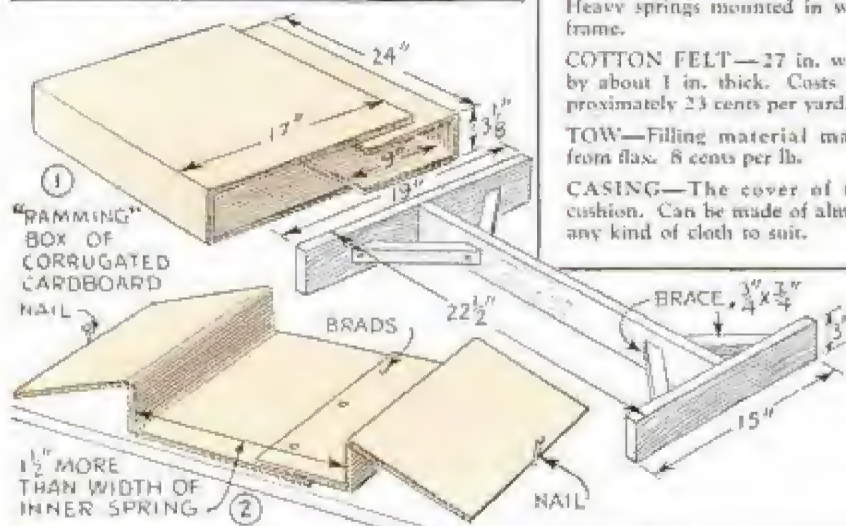
**INNER SPRING**—Small springs sewed in muslin pockets and assembled into mats. Sizes are multiples of 3. Regular cushion size, 21 by 21 in., costs slightly over one dollar.

**CONSTRUCTION SPRING**—Heavy springs mounted in wire frame.

**COTTON FELT**—27 in. wide by about 1 in. thick. Costs approximately 23 cents per yard.

**TOW**—Filling material made from flax. 8 cents per lb.

**CASING**—The cover of the cushion. Can be made of almost any kind of cloth to suit.



③ SPRING AND FIRST LAYER OF COTTON IN BOX



④ COTTON FOLDED IN AND SECOND LAYER ADDED



⑤ BOX CLOSED AND FASTENED WITH GUMMED TAPE



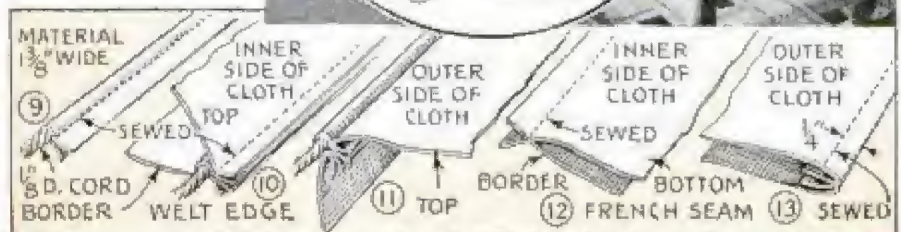
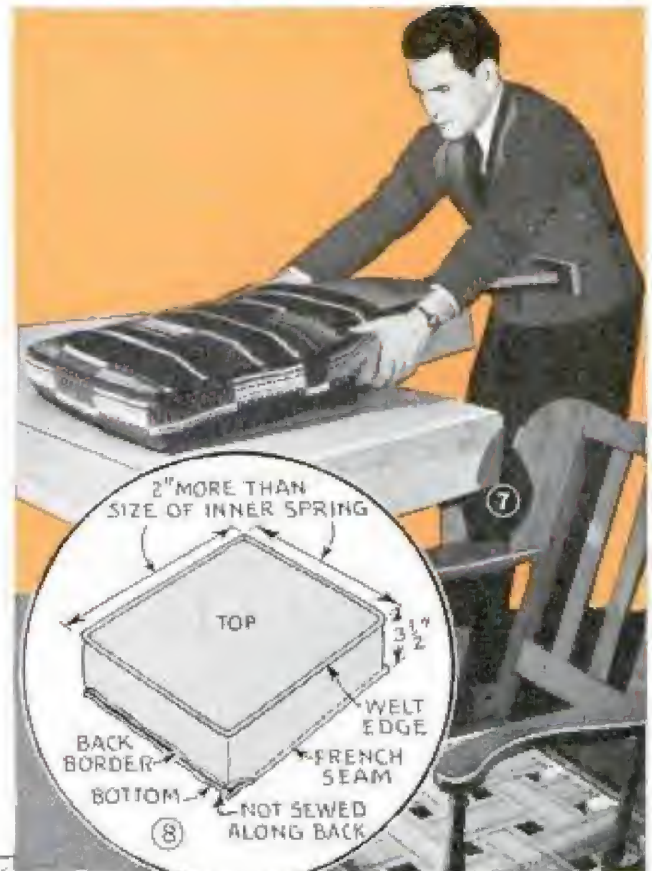
⑥ CASING STRIPPED IN PLACE OVER BOX



# TAILORED CUSHIONS

Fig. 7. The casing should be sewed complete except the bottom edge of the back and a short distance along the sides, Fig. 8. The seam used between the top and the border is a "welt edge," made as shown in Figs. 9, 10 and 11. The seam at the bottom is a French seam, made by joining the cloth inside out, Fig. 12, then folding it back and sewing again about  $\frac{1}{4}$  in. in from the fold, as shown in Fig. 13.

Where a construction spring is used, the filling is best done by hand. Start by sewing a piece of burlap over the top and sides, as in Fig. 14. Next, pad the top with excelsior or tow, Fig. 15. Cover the spring with two layers of cotton felt, and then strip the casing in place, Fig. 16. The casing for this method is sewed all around the top and the front edge of the bottom on the sewing machine, leaving the other three sides to be sewed by hand after filling. Fig. 17 shows cotton felt being added to the sides, this partly covering the bottom, while in Fig. 18 the cushion is shown partly fastened together with pins in preparation for hand sewing.



⑭ SPRING COVERED WITH BURLAP



⑮ OPEN BOTTOM CASING FITTED IN PLACE OVER SPRING



⑯ FILLING PLACED OVER TOP



⑰ PADDING ADDED ALONG SIDES



⑱ BOTTOM PINNED TO BORDER



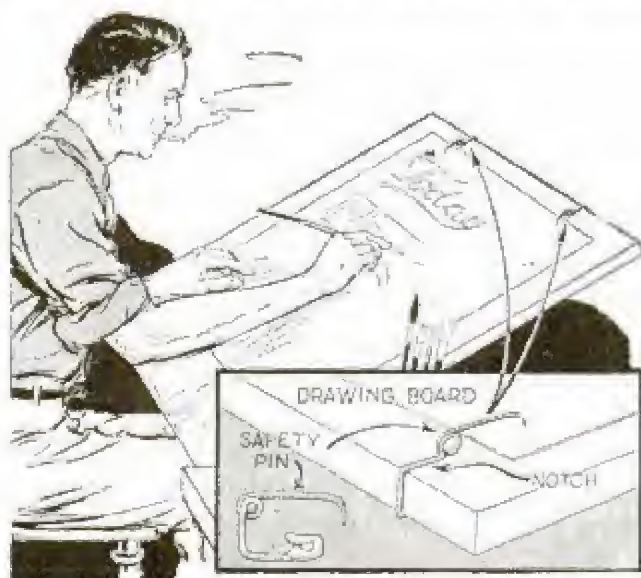
## Spaced Hooks on Trotline Engage to Avoid Entangling



To keep hooks of a trotline from entangling when winding or unwinding it on a reel, one fisherman uses the following method: Space the staging lines so that the hooks at the end of each can be engaged as indicated.

## Bent Safety Pins Hold Work on Drawing Board

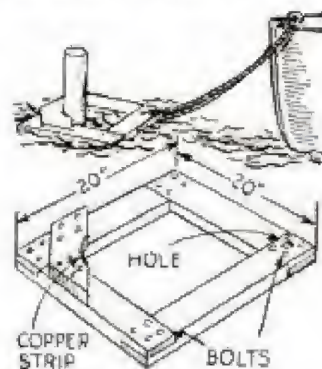
To hold showcards and price tags on a drawing board for rapid lettering without the annoyance of inserting and removing thumbtacks, I used safety pins. These were bent to the shape shown, and were



inserted in slots sawed in the edges of the drawing board. The pointed ends of the pins hold the work securely, and placing or removing it is just a matter of lifting the portions of the pins that project over the work.—G. E. Hendrickson, Argyle, Wis.

## Small Boat Fastened to Post Safely with Wood Float

Having experienced considerable trouble with my boat because the chain would wind around the stake to which it was fastened, I built this simple float which is slipped over the stake and rotates as the boat drifts around, rising and lowering with the tide or high waves. Assembled from 1¼ by 4-in. oak, the float is held together with ¼-in. brass bolts.—Linwood Webb, Greenport, N. Y.



## Soap Dish Makes Bird Bath in Canary's Cage

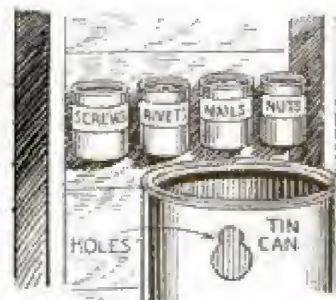


RUBBER SOAP DISH

A rubber soap dish makes an excellent bath receptacle for canaries. It will not slip on the bottom of the cage and the sides provide an easy grip for the bird's feet.

## Cans Containing Small Parts Easily Hung on Wall

If you use empty tin cans to hold your supply of nails, screws, bolts and other small parts, cut small openings, of the shape shown, in the sides. Then you can hang them easily on nails or screws that project slightly from a wall.





# SMALL PELTS TANNED

## *at home by simplified process*

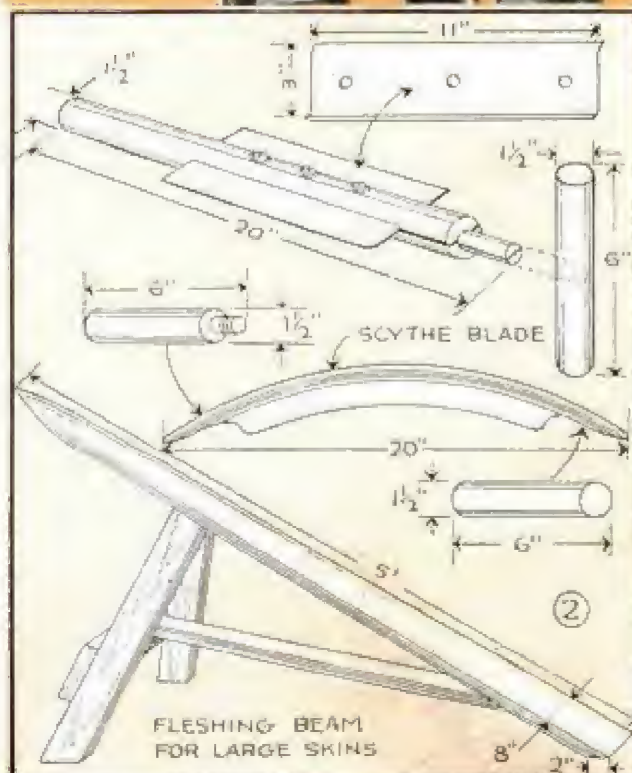
By John William Moyer

Staff Taxidermist  
Field Museum of Natural History

ALTHOUGH there are no tricky formulas or involved processes to bother with when tanning a skin by hand methods, the procedure takes work. What you're after is soft, pliable leather and, once the pelt is put through the tanning solution, it is the plain labor of "beaming" and "tubbing" that produces the softness and pliability characteristic of a first-class job of tanning. The tools one will require are not many and can be made, or bought very cheaply from taxidermy supply houses. Fig. 2 shows the essential tools. They are the currier's knife, a fleshing knife and a fleshing beam for the medium and larger skins. In addition you will likely need two skinning knives and a small shaving beam.

A currier's knife can be made from an old saw blade as in the upper details in Fig. 2. Have it ground down until rectangular in shape with two cutting edges. These should be ground razor-sharp and with wide bevels. Drill three holes along the centerline of the blade. Then round a 20-in. length of hardwood to about 1½-in. diameter, and another piece to the same diameter and 9 in. in length. Bore a ¾-in. hole transversely through the center of the shorter piece. Form a ¾ by 1½-in. dowel on one end of the longer piece and then slit the latter with a hand saw, from one end straight through the center to a point within about 6 in. of the opposite end. Drive the handle over the dowel and pin or rivet it in place. Slip the blade in the slot, bore holes and fasten with small stove bolts. Then wind the slotted end of the handle with cord to make a comfortable handhold. Finally, turn both cutting edges with a large knife steel in the same way that you would turn the edge of a floor or cabinet scraper.

Skins are first shaved down on a fleshing beam to prepare them for the tanning solution

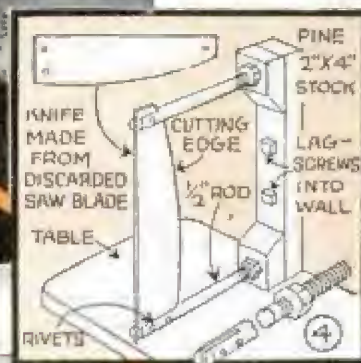


Here are the essential tools you need for preparing the skin





3



PINE 2"X4" STOCK

CUTTING EDGE

1/2" ROD

LAG-SCREWS INTO WALL

TABLE

RIVETS

4



5



6

After fleshing, the skin is salted and rolled up flesh side in; after two days, or longer, the salt is washed out in clear, soft water

A suitable fleshing knife can be made from an old scythe blade cut down to about 20 in. in length. Have the blacksmith shape a shank at each end so that the blade can be fitted with wooden handles. Bind the latter at the ferrules with fine wire to prevent splitting. The two knives just described are for the shaving of fairly large skins but for the smaller ones such as muskrat, mink, weasel or skunk an upright fleshing knife such as that shown in Figs. 3 and 4 is more suitable. This knife can be purchased or can be made from an old saw blade by filing off the teeth and grinding and honing the edge. The knife should be supported on a bench in the manner shown in Fig. 4, or it can be bolted to a wall.

Before the actual tanning of skins can be started, one will have to make two fleshing beams to rest the skins on while shaving down the flesh side. A small shaving beam can be whittled from a length of hardwood 12 in. long and about 3 in. wide. Shape the end to a blunt point and round over the top side so that the skin will slide easily while being worked. The larger skins are shaved down on the large fleshing beam as in Fig. 1. The upper end of this beam should be rounded over and smoothed and the edges rounded over the full length.

The purpose of shaving or fleshing, as it is called, is to remove cartilage, fat and flesh from the skin so that the tanning solution can take full effect. As soon as the skin is removed from the carcass the ears, nose and lips must be opened up. This is very important, as the solution will not act on these parts unless they are carefully skinned out. This done the skin is immediately salted down with common salt, and rolled up, flesh side in, Fig. 5. Leave it rolled up for at least a couple days. Then it is washed out in clear, soft water and hung up to drain, Fig. 6. Skins that become dry after salting should be soaked until pliable by immersing them in soft water to which a few drops of carbolic acid have been added, about  $\frac{1}{2}$  teaspoonful to the gallon of water. Smaller skins can be shaved down with a small skinning knife, or the upright knife can be used as in Fig.

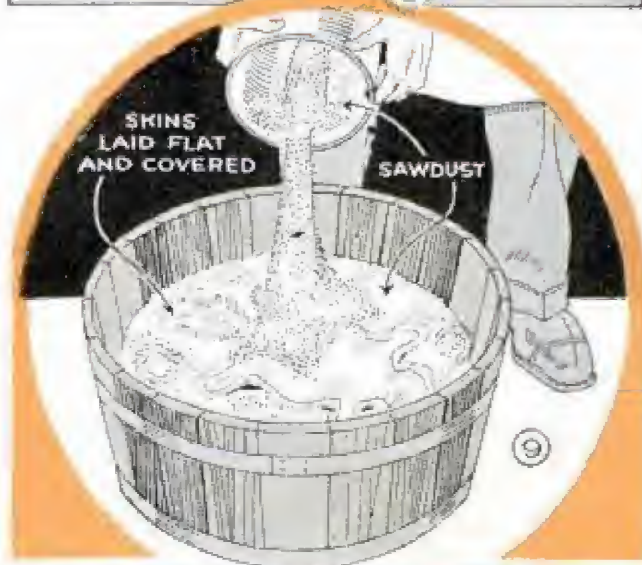
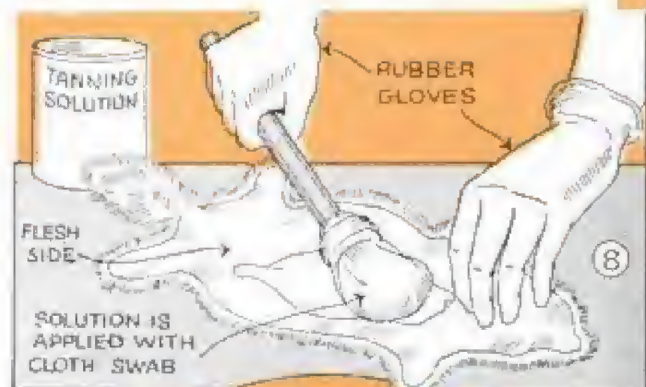


3. In working the larger skins the currier's knife is used. Notice in Fig. 1 the proper way to hold the knife. This is important, for if the knife is not held correctly, one is likely to cut holes in the skins. It is also necessary to be very careful not to shave the skin down too thin as this will cut off the hair roots, causing the hair to fall out during the process later. While fleshing or shaving, the knife will become dull and must be sharpened quite often, and the edge turned each time with the steel.

After the skin has been shaved to the proper thickness, it should be beamed lightly as in Fig. 7, then stretched flat on the floor, flesh side up, and swabbed over with a solution of tanning liquor, Fig. 8. To make the liquor, bring water, 1 gal., to the boiling point. Then add salt, 1 quart, and stir until thoroughly dissolved. Finally add sulphuric acid,  $1\frac{1}{2}$  oz. by measure, slowly to the salt solution. Allow the liquor to cool before applying it to the skin. Keep it in a wood or glass container. Give the skin one application of the liquor, making sure that all parts are covered. Leave it flat over night, swab it again and then roll it up, flesh side in. Large skins should have a third application the following day and then be hung up to dry. Do not allow the skin to dry hard at any time during the process. It should be noted just here that skins may be kept in the tanning liquor from two days to one year and the longer they stay in the liquor the better they will tan. After draining, the skin should be beamed, Fig. 7, until it is soft and pliable. This will take time and plenty of "elbow grease." Following this, several hours of it on the average skin, you coat the flesh side with pure neat's-foot oil and then you're in for the "tubbing," Fig. 9. In the commercial tanneries this is accomplished with special equipment unsuited to the needs of the individual tanner. However, the same result can be obtained by simply tramping the skin, or skins, in a large wooden tub filled about one-half full of hardwood sawdust. If the skins are small, work several of them at a time in the tub. During the tramping process stop now and then to shift the skins and turn them first one side up and then the other. Tramp them until all traces of stiffness has been worked out. Finally, shake out the sawdust and lay the hair with a fine comb.



*First work the skin over a fleshing beam to soften it; then apply the tanning solution to the flesh side*



*Finally coat the skins with pure neat's foot oil and place in a wooden tub one-half full of hardwood sawdust*



## Aggregate Heater on Small Jobs of Concrete Work



Two lengths of stovepipe and an elbow assembled as shown provide a simple heater for sand and stone on small concrete jobs. The heater is set in the aggregate pile in the position indicated and is fired with a piece of cotton waste soaked in fuel oil or old crankcase oil.

## Shoe Scraper Has Dirt Catcher Made from an Oil Can

Disliking the accumulation of dirt beneath a shoe scraper, a housewife had a discarded oil can cut to hang below it. At-



tached with a single nail, the can is quickly and easily removed when it becomes full enough to empty.

## "Life-Belt" for Boat Keys

When working around a boat or dock where you might accidentally drop your keys into the water, it is a good idea to slip an ordinary round fish-line bobber on the key ring. The cork will keep a number of keys afloat in the water and is plainly visible.



## Grip on Hand Wheel Improved by Driving Tacks in Edge



When a wood hand wheel was substituted for a broken one of iron in an emergency, upholstery tacks were driven into the edge of the wood to afford a good grip for the fingers when turning it. The tacks should be spaced a distance equal to about the width of one finger.

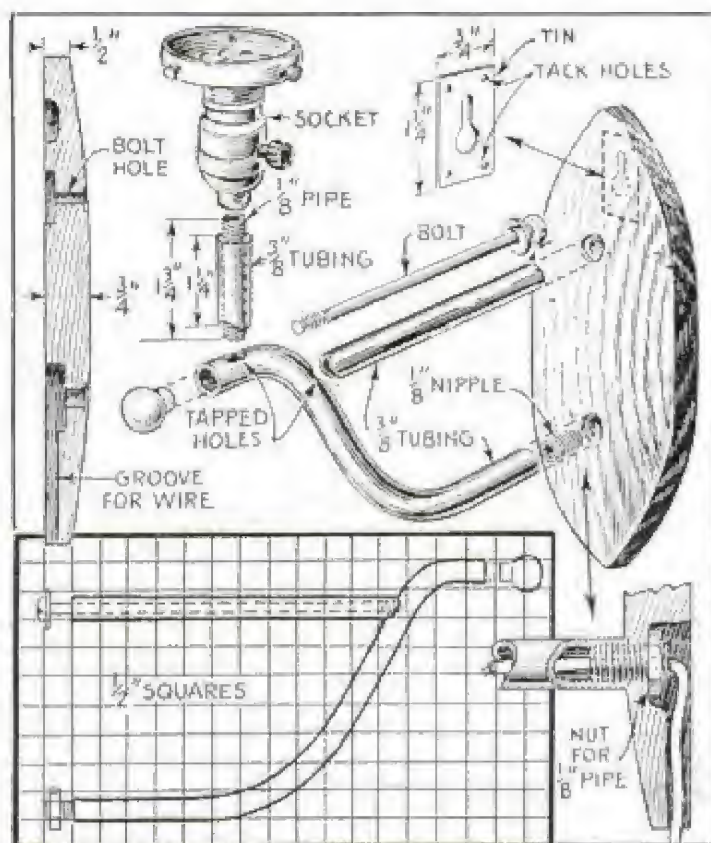
## Repairing Lawnmower Pinion

When the shoulders of a lawnmower pinion, against which the pawls catch, become so worn that the cutting blades do not rotate, the pinion often can be repaired by cutting a slot across the shoulder as indicated to restore it to the correct angle. The slot can be cut with a hack saw, which should be held at a 45° angle to avoid cutting the opposite side of the pinion.





## Chromium Tubing Enhances Pin-Up Lamp



Here is a lamp you can hang any place on a wall. All you need do is drive screws into the wall at the desired locations, allowing the heads to project slightly to slip into the "keyhole" hanger on the rear side of the lamp base. Exposed metal parts are chromium-plated, including the lamp socket and reflector holder. The base is made of wood, finished natural or painted to suit. The holes in the base are counterbored to take the tubing.

## Discarded Brake Drum Shields Grinding Wheel on Lathe



Owners of home workshops who use grinding wheels mounted in their woodturning lathes can have brake drums as shields. This one was taken from a car having an emergency brake drum on the drive shaft. This type has the advantage of a small diameter and a deep flange. The drum is notched for clearance around the wheel by cutting out a segment as shown, after which it is bolted into position. A wood disk 3/4 in. thick is fastened into the open side of the drum to enclose the wheel.

☐ When spraying the foliage of house plants use tepid water.



## Skin Pulled Off Catfish Easily with a Pair of Pliers



You can skin a catfish easily with a pair of pliers. First kill it with a sharp blow on the head. Then cut off the fins and drive a nail through the head and into a board. With a sharp knife, cut through the skin around the fish just back of the head. Now grasp the edge of the skin with a pair of pliers and pull back toward the tail.

## Fountain Pen Provides Holder for Toothpicks in Your Pocket

If you are in the habit of carrying toothpicks in your pocket, a holder to keep them is made easily from an old fountain pen. Just remove the rubber ink bag along with



the pen point, wash out the inside of the barrel thoroughly, and your holder is ready for use.

## Combined Bird Bath and Feeder

Birds can feed and bathe at this unit, which also serves as a neat garden decoration. It consists of a pipe standard topped by a feeder about 8 in. square, under which is a disk-harrow blade to serve as a water tray. The roof of the feeder, which is supported by four corner posts, is covered with strips of wood overlapped slightly.



## Stop Rods on Miter Gauge of Saw Improved by Rubber Tubing



Two short lengths of rubber tubing slipped over the miter-gauge stop rods of a circular saw, as shown, will permit the clamp to grip the rods more securely with less pressure. This

makes the wing nut that operates the clamp easy to tighten or loosen.

—Howard R. Heydorf, Missoula, Mont.

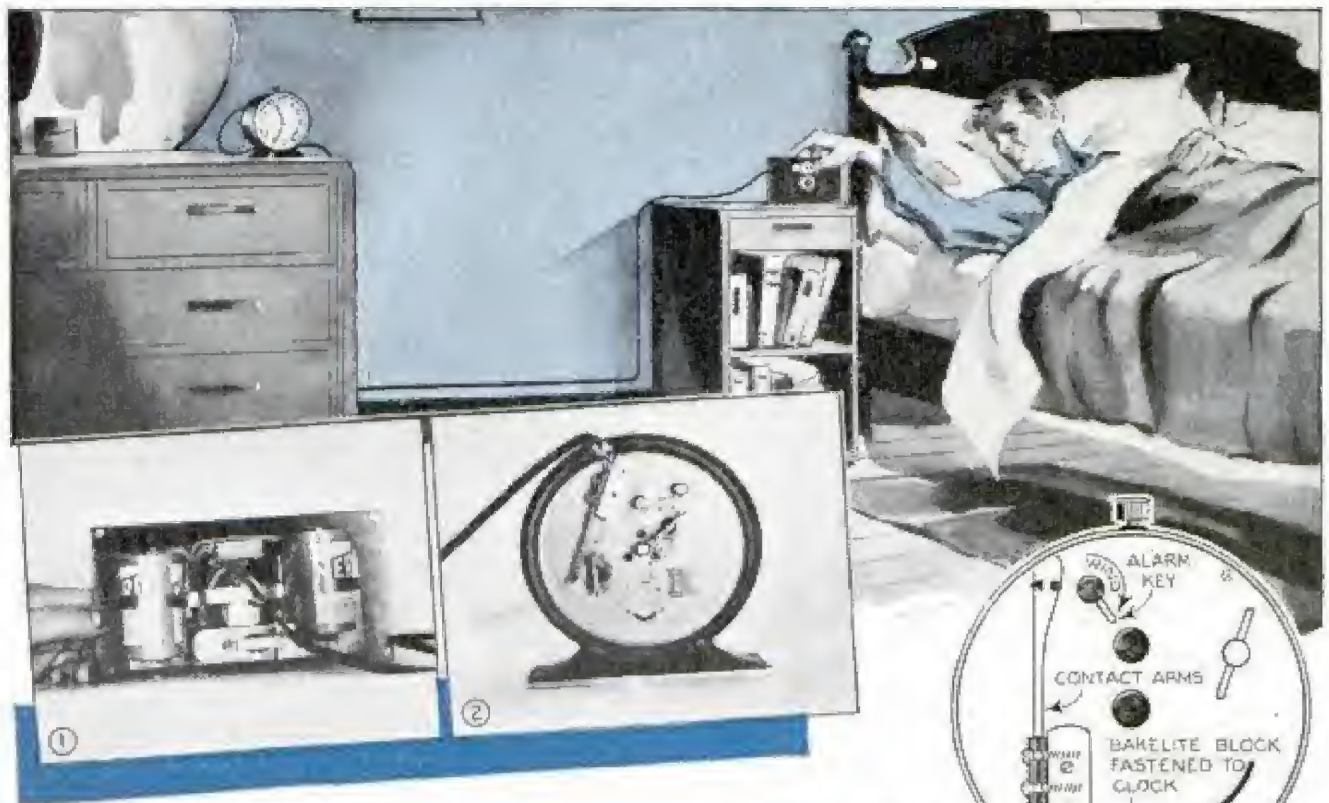
## Small Drills Stored in Block

One craftsman uses a wood block of the shape shown to hold his drills and small tools so that he can carry them about easily as required. The block is stable, of large capacity and the handle, which is patterned after the handle of a hair-brush, is gripped with the fingers.

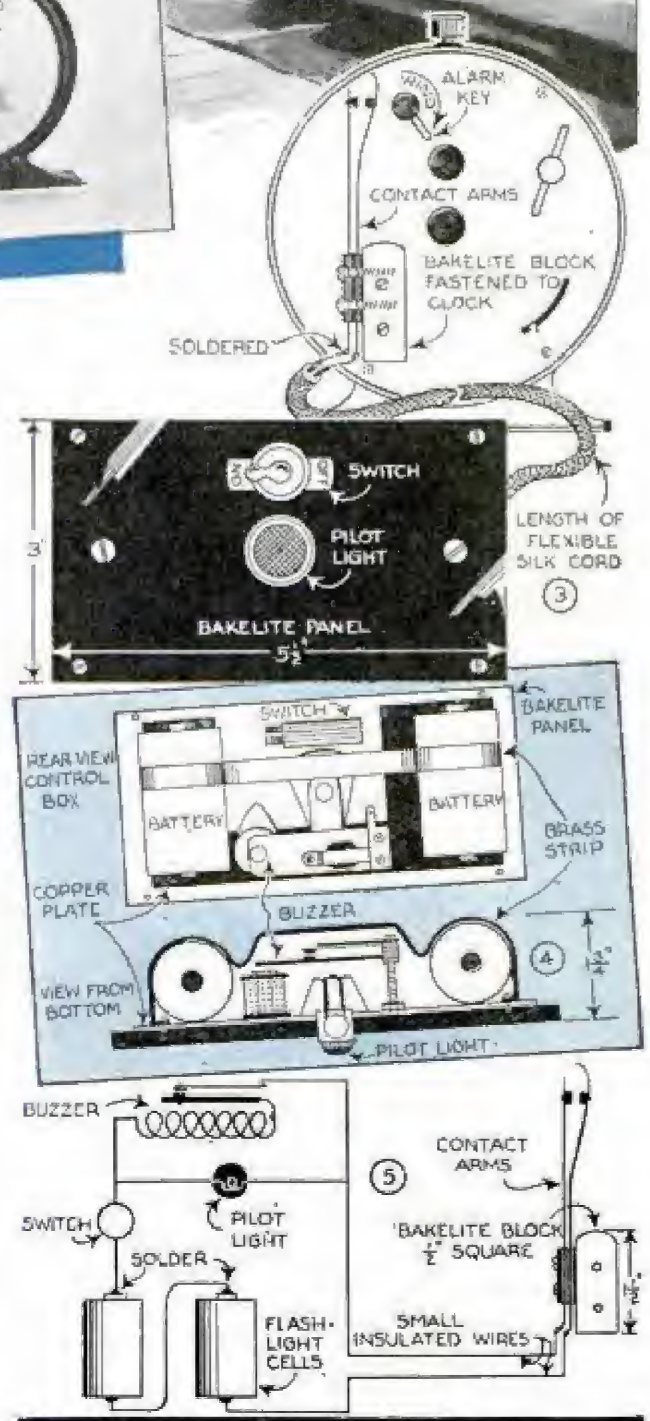




# Remote Alarm Clock Starts Buzzer Near Bed



If the ticking of your trusted alarm clock prevents sleep at times, this remote-control unit, built chiefly of old radio parts, will enable you to place the clock at a distance from the bed, or in a clothes closet, so that the ticking will not annoy you. At the time set, a buzzer alarm rings softly at intervals close beside the bed. Simultaneously a dim light illuminates the switch on the control unit so that the alarm may be turned off when you awaken. The control unit, Figs. 1, 3 and 4, consists of a Bakelite panel covering a small metal or wood box which contains two flashlight cells and a door buzzer or one constructed from a radio relay. A brass band holds the dry cells in place and connections are made by soldering the wires directly to the cells as indicated in Fig. 5. Switch and pilot light are mounted on the panel as in Fig. 3. Two contact arms, taken from an old radio relay or phone jack, are fastened to a small Bakelite block which is mounted on the back of the clock, Figs. 2 and 3. The arms must be located in such a position that the projections of the alarm key will strike one of the arms, thus closing and opening the circuit at intervals. The bell-ringing mechanism of the clock is, of course, removed.—Herman R. Wallin, New York.





# Solving HOME



Here's a way to remove the stems in a hurry from gooseberries and other small fruits. Set a small bottomless box over a window screen, fill with berries and slide the box back and forth



SCREEN

Fitting a vacuum cup on the egg beater as shown at the right, not only silences the noise but holds the beater upright and prevents it from sliding in the bowl

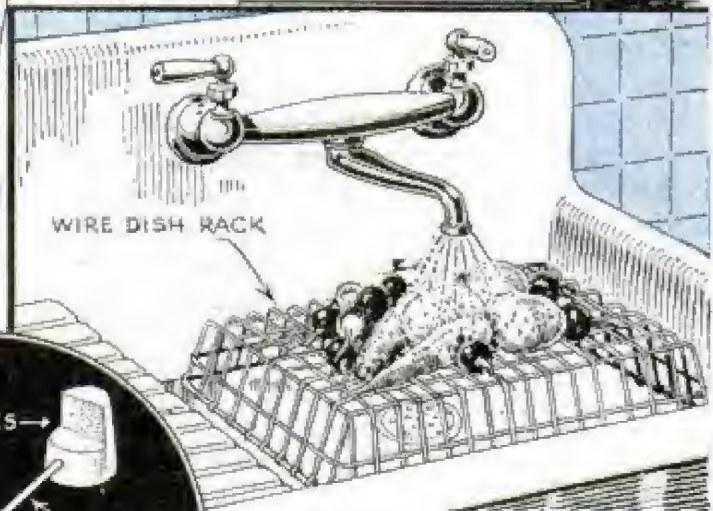


CLOTHESLINE

SLOTTED EARS

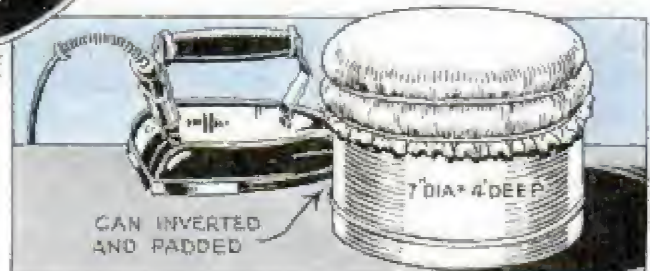
A handy clothespin container can be made from a small water pail. Simply remove the bail and slot the "ears" as shown

WIRE DISH RACK



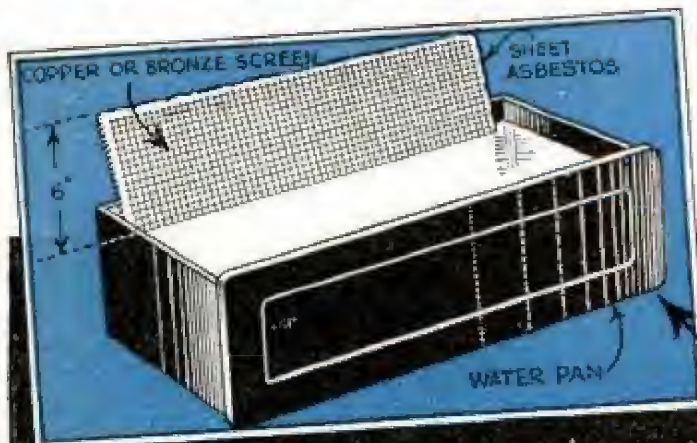
To wash vegetables in the sink most conveniently, invert a wire dish rack in the sink and spread the vegetables on it so that water from the faucet can flow over and around them

Meat skewers and corks combined make a neat base for potted plants requiring little moisture, which are set on a window sill. Notch the corks and force the skewers through them as shown. Right, padding the top of a large can makes an ideal surface for ironing pockets, shoulders and seams in shirts





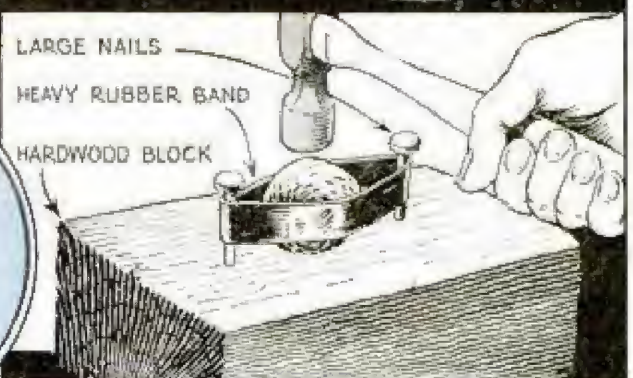
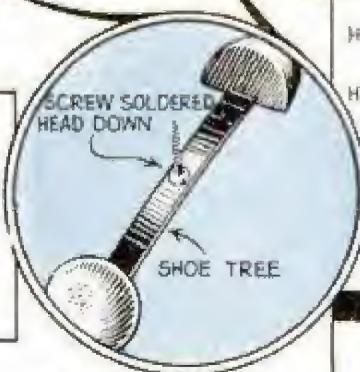
# PROBLEMS



A "wick" of asbestos board encased in copper screen and placed in the furnace water pan will practically double the normal evaporation. A small weight, such as a piece of brick, will prevent it from sliding down into the pan when water is poured in



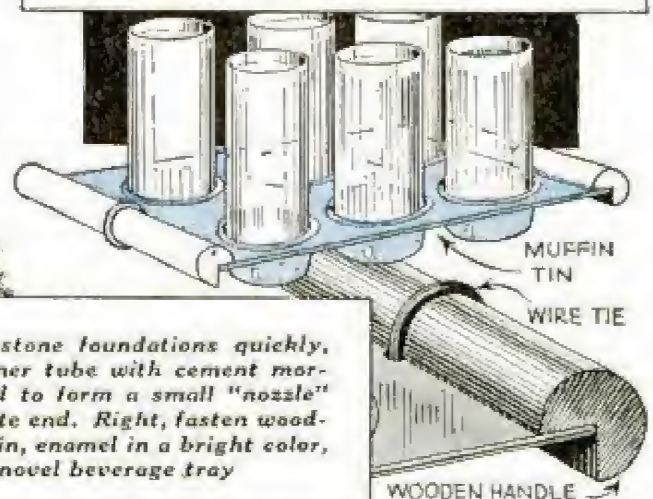
Shoe trees screwed to the lower edge of the bed rail, as shown above, keep your bedroom slippers handy, out of sight and always in shape



To crack walnuts without bruised fingers and flying shells, drive two nails in a hardwood block and snap a rubber band around them



Above, to "point" up stone foundations quickly, fill a 2-ft. length of inner tube with cement mortar, pinch the open end to form a small "nozzle" and then roll the opposite end. Right, fasten wooden handles to a muffin tin, enamel in a bright color, and you have a novel beverage tray





## Small Photos Framed in Rims of Round Tags



If you have a few miniature photos that you want protected against tearing, yet have them so that they can be viewed easily, frame them in metal-rimmed tags. Just

remove the cardboard from the center of the tag, spread one side of the rim with a sharp knife blade and insert the photo, which has been trimmed to a snug fit. Then press the side of the rim down against the photo with a round-nosed tool.

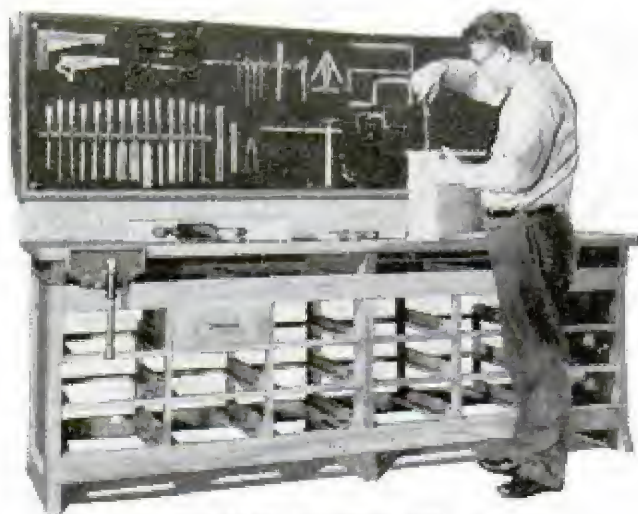
## Edges of French Curve Beveled to Avoid Smearing Ink

When running a ruling pen along the edges of a French curve, ink is less likely to get on the work and smear it if the edges are beveled. This can be done with a small file.



EDGE FILED AT ANGLE

# Why Not Start a Home Workshop?



Cabinet Workbench—898

**DRILL PRESS—895:** Pipe fittings.  $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

**BELT SANDER—579:** Heavy-duty type. Angle-iron framework and a 5 by 46-in. belt—25c.

**VERTICAL SPINDLE SANDER—560:** Fine for curved surfaces. Table 10 by 17 in.—25c.

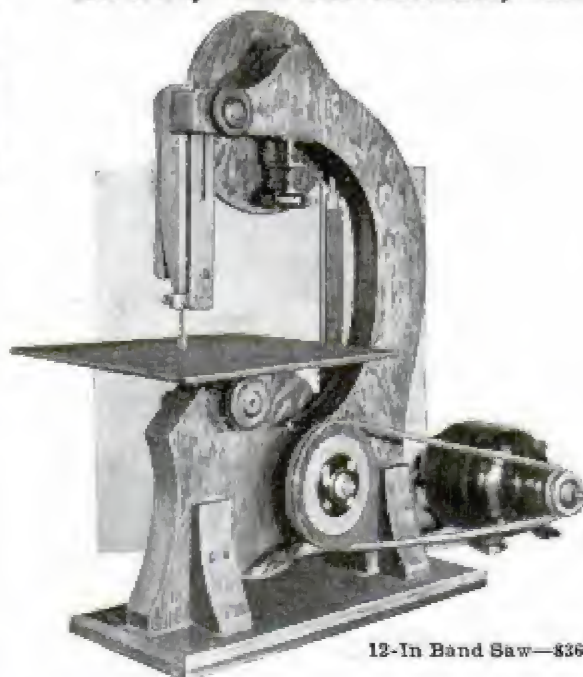
All six plans listed above will be sent to you upon receipt of \$1.00, or separately for 25c each. Also, be sure to get a copy of our new 32-pp. illustrated catalogue, which lists hundreds of other plans on modern and colonial furniture, outdoor-sports devices, models of all kinds, radio equipment, juvenile articles, etc. The only cost for this catalogue is a three-cent stamp. Be sure to print your name and address clearly when ordering.

*A few homemade machines will enable you to get into this interesting field. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need.*

**CABINET BENCH—898:** Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.

**22-IN. SCROLL SAW—771:** Pipe fittings and hardwood. Has sewing-machine drive—25c.

**12-IN. BAND SAW—836:** Smooth running and sturdy. Cuts 2-in. stock easily—25c.



12-In Band Saw—836

Address Plan Service, Popular Mechanics Magazine, 200 E. Ontario St., Chicago





# TELEVISION

## Three Varieties

IF TELEVISION programs are available in your locality, and you are in the market for a receiver, there are three different types to choose from. No. 1 is the "direct viewing" variety where the picture appears at the front of the cabinet. The console instrument shown provides both sight and sound reception. No. 2 is a small direct-viewing table-type picture receiver with sound converter; it can be used to receive "video" tel-



elevision pictures without sound, or, it may be employed in conjunction with several special types of regular broadcast receivers

in video-sound combination. Photo No. 3 shows a console instrument for sight and sound in which the picture is viewed in a mirror on the under side of the raised lid.

Set No. 1 employs a 5-inch "kinescope" tube which provides a 3 $\frac{3}{8}$  by 4 $\frac{3}{8}$ -inch picture. There are 24 other tubes, plus the picture tube, and an 8-tube all-wave receiver. The table-type set No. 2 uses a 5-inch television tube in the complement of 17 tubes. This set stands 14 $\frac{1}{2}$  inches high and is approximately 20 inches wide and 19 inches deep. Set No. 3 is a de luxe console instrument in which a 12-inch kinescope tube produces a picture 7 $\frac{3}{8}$  by 9 $\frac{3}{4}$  inches. There are a total of 36 tubes in this set, 12 of which are included in a 3-band high-fidelity radio chassis; the cabinet is 40 $\frac{5}{8}$  inches high, 34 $\frac{5}{8}$  inches wide and 19 $\frac{7}{8}$  inches deep with hinged mirror lid.

*RCA Victor, Camden. N.J.*

*General Electric Co. 570 Lexington Ave. New York*



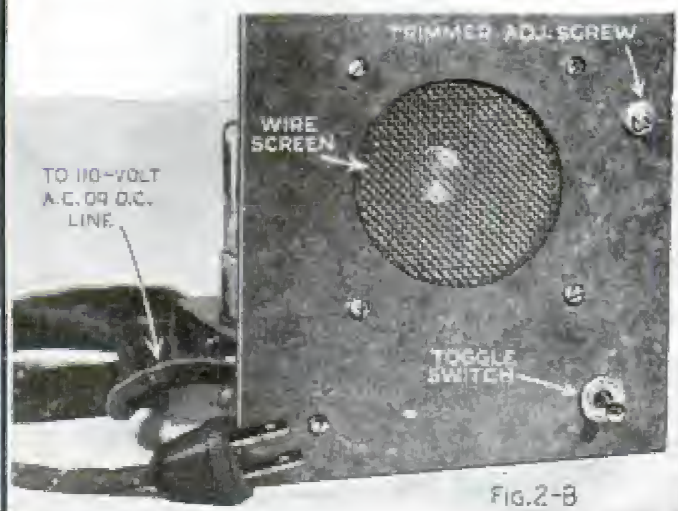
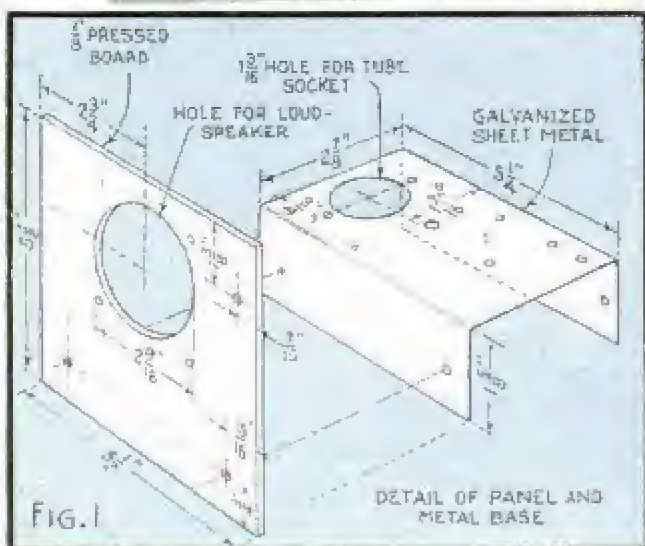
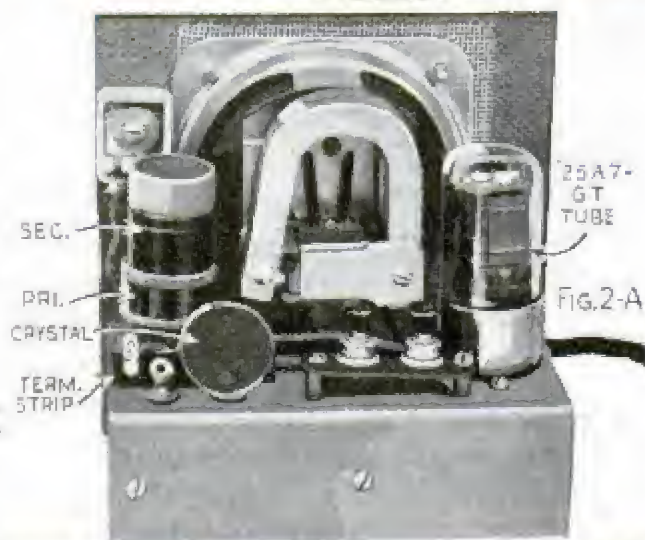
# BEGINNER'S One-Tube



ALTHOUGH designed especially for beginners, this unusual little set includes several features of interest to all radio experimenters. It is "all-electric," uses a fixed crystal detector and a single tube of the new "bantam" variety. The dual-purpose type-25A7-GT tube is a pentode audio amplifier, and also a half-wave rectifier which supplies power from any 110-volt a.c. or d.c. power line.

No claim is made for distant reception, but if you live within range of a local broadcasting station that provides good headphone volume on a crystal set, this compact little all-electric one-tuber will bring that station in with sufficient volume to operate the small magnetic speaker. No headphones or batteries are required and the standard parts specified are easily obtained at low cost.

The compact design of the set is made possible, in part, by the use of a "trimmer" condenser to tune the coil instead of the usual larger variable condenser. The latter was regarded as unnecessary since the set is designed primarily to receive the "best" broadcast station in a given area. The tuned circuit is "padded" with a fixed condenser (C) which is connected across (C<sub>1</sub>), and the electrical value of this mica-type fixed condenser depends upon the frequency of the station to which it is desired to tune. However, this value is not



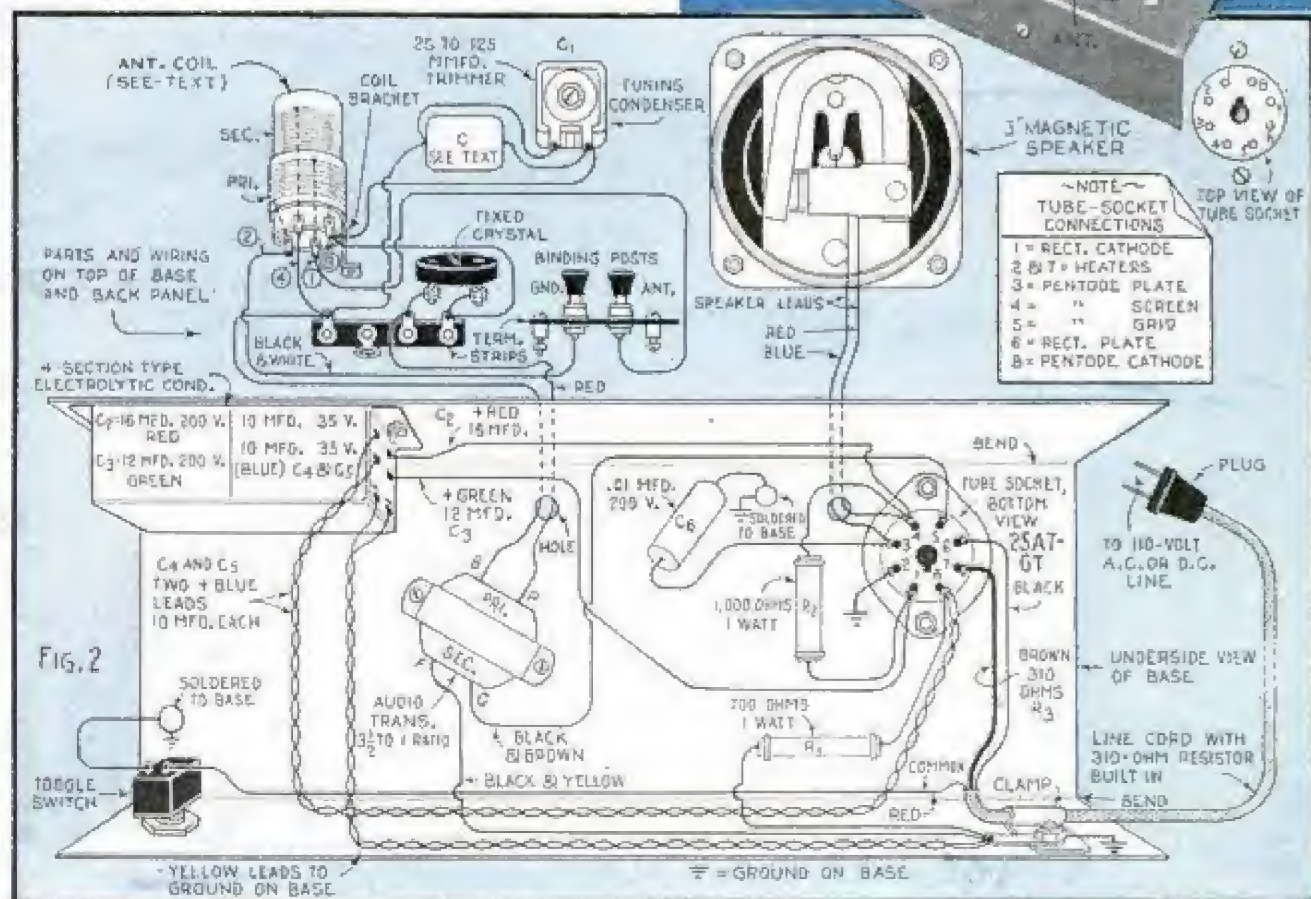
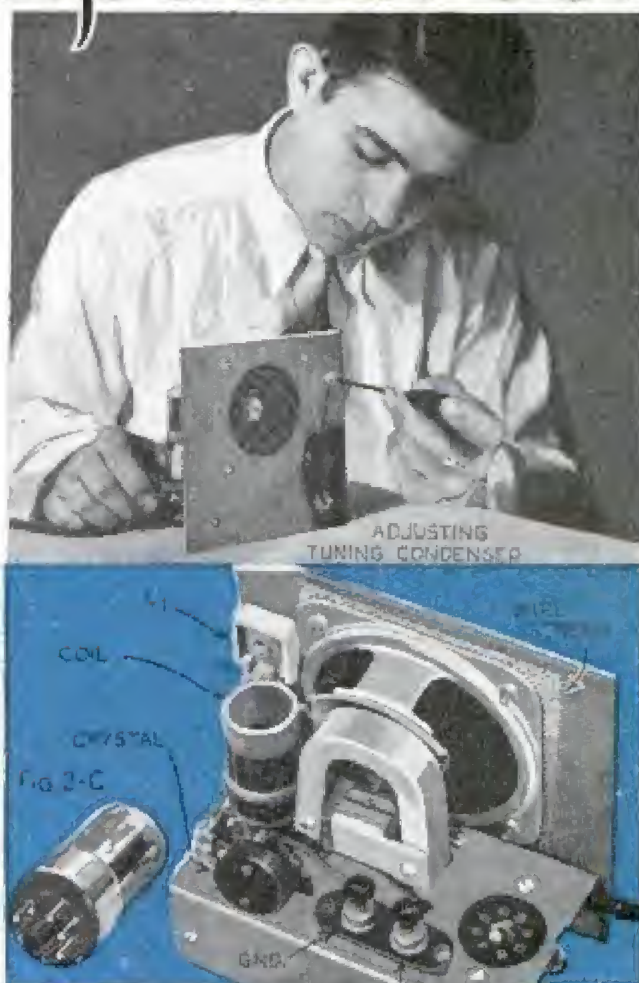


## A.C.-D.C. Loudspeaker Set

critical, and the trimmer condenser ( $C_1$ ) provides adjustment for "tuning on the nose." If the station you wish to hear has a frequency between 550 and 800 kilocycles, fixed condenser ( $C$ ) should be .00025 mfd. For reception between 800 and 1,200 kilocycles use .0001 mfd. For a station between 1,200 and 1,600 kilocycles the fixed condenser ( $C$ ) is omitted entirely.

Complete chassis and panel details are shown in Fig. 1 and a simplified wiring diagram is given in Fig. 2. This wiring diagram shows all parts and wiring under the chassis base and every lead running up to the parts mounted on top of the base and on the panel. The 3-in. magnetic speaker is protected by a small piece of copper screen and is mounted on the panel in the position shown in photos Figs. 2-A, 2-B and 2-C. These photos also show the arrangement of each part on top of the chassis base. A schematic diagram is given in Fig. 3. The antenna coil is an r.f. midjet solenoid type used instead of a regular

(Continued to page 132A)





# How to Build a Push-Button Radio-Set Tester

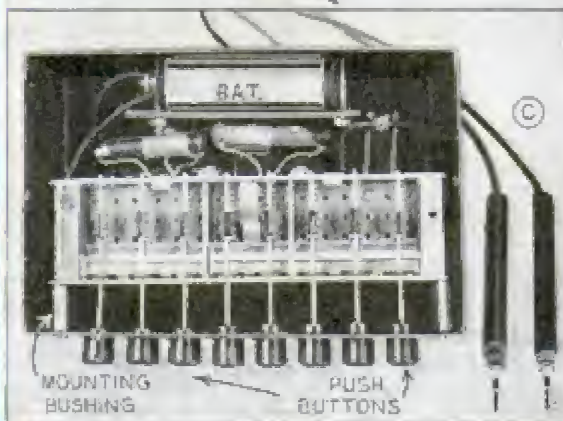
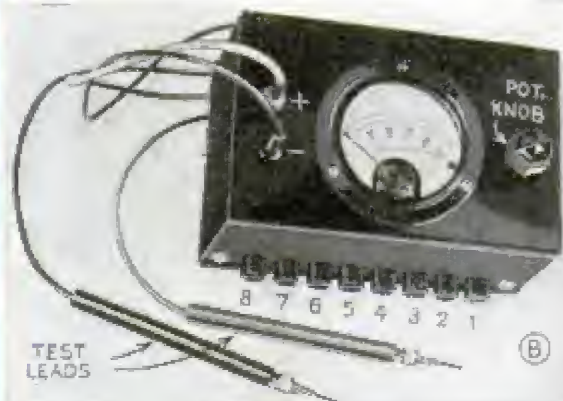
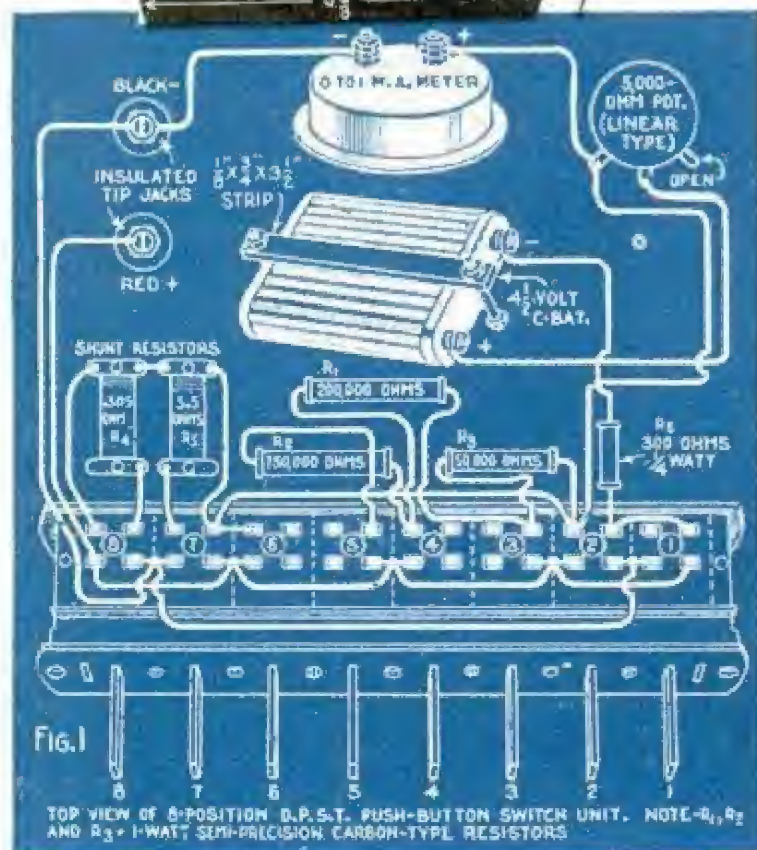


**A**VOID incorrect connections and possible meter burn-outs with this push-a-button set tester. You can check any radio circuit quickly and without a chance of confusion; merely plug the testing prods into the tip jacks and select the correct scale, by means of a push button, for voltage, resistance and current readings.

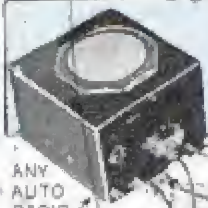
Any good 3-in. meter with an 0 to 1 m.a. movement may be used in this compact homemade unit, which is housed in a sheet-metal case  $6\frac{1}{4}$  in. long, 4 in. wide and  $2\frac{7}{8}$  in. deep with bottom cover. The meter is provided with a new scale of the "Ham Crystals" type which is available from radio parts houses for nineteen cents. This scale provides volt-ohm-milliammeter readings as follows: d.c. volts 0-50, 0-250, 0-1,000; current of 0-1, 0-10 and 0-100 milliamperes; a high-ohm scale reading in reverse up to 100,000 and a "back-up" low-ohm scale for resistance measurements.

A 5,000-ohm linear-type potentiometer is used for adjusting the zero position as the  $4\frac{1}{2}$ -volt flat-type "Eveready" "C" battery ages. The push-button unit is a "Muter" type designed to serve as an 8-position, double-pole single-throw switch.

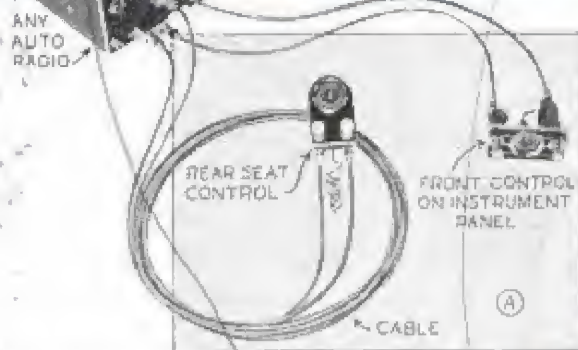
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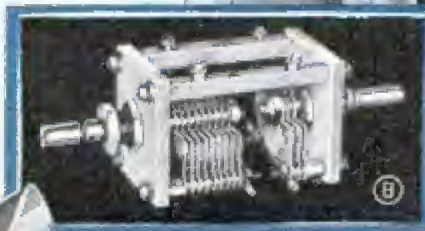
# Helpful RADIO HINTS



(A) Improved dual control permits rear-seat tuning of any car radio without disturbing the regular dashboard control; both dials show same station reading when either is turned

(B) Short-wave band-spread condenser combines a low-capacity section for "band-spread" with a high-capacity for "band-set"; both units in one compact midget frame

(C) Low-cost non-inflammable flexible blank disks for amateur sound recording in homes and schools; uniform surface is claimed to reduce "wows"; easily mailed and stored

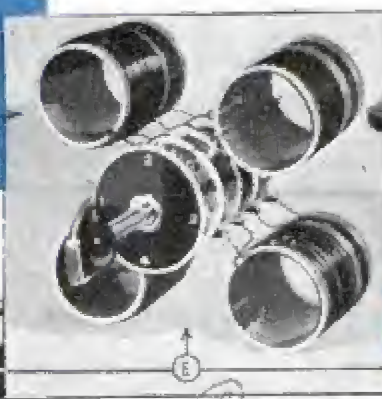
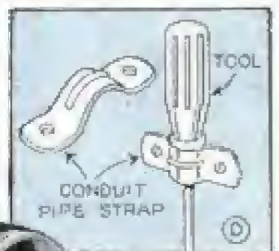


(D) Conduit pipe straps make good tool-holders for your radio workbench or portable service kit

(E) 4-gang 4-position rotary switch used to change coils, for short-wave bands, from front panel. You can either mount your regular plug-in coils in the manner shown, or, make new coils following the data given below. Coils are mounted with stiff wires close to switch; the common terminals are wired to the parts which previously were connected to the coil socket

Term.	Band	Pri. Turns	Wire	Sec. Turns	Wire
1	20	3X	20 PE	8X	20 PE
2	40	5X	20 PE	16X	20 PE
3	80	9	30 DSC	36	20 PE
4	160	15	30 DSC	72	30 DSC

For .00014 mfd. condenser.  
PE—plain enameled.  
DSC—double silk covered.  
X—coil turns spaced one diameter, all others close wound.





## Compact Mobile Sound System in Standard Coupe

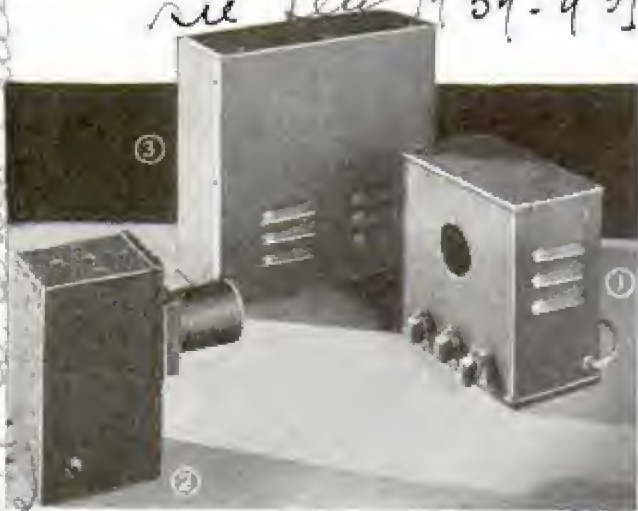


With only two speakers as external evidence of its sound system, this compact mobile installation includes a 30-watt amplifier on the shelf behind the seat, with all controls accessible to the driver, and a 300-watt gas-driven generator concealed in the rear compartment. Air ducts provide ventilation and the car body muffles the noise of the motor.

## "Invisible" Burglar Protection

A source of invisible infrared light and a sensitive photoelectric cell are employed

*see Jan 1939 - 939*



in this burglar-alarm system. In operation the infrared light (2) is focused upon photocell relay (1); any interruption of this invisible light beam operates the relay that rings a bell in unit (1). Unit (3) is an external remote alarm that may be used in conjunction with the same relay.

## Tiny Portable Radio Receiver

Now you can actually hold a portable radio in the palm of your hand while it plays. This 3-tube self-contained battery-



operated receiver weighs slightly more than 3 pounds complete with batteries and built-in antenna. The set measures only 6¾ in. high, 5½ in. wide and 3½ in. deep. It is housed in an embossed leatherette cabinet and provided with a handle.

❏ Blueprints covering radio construction articles in this and past issues are available for 25 cents each. Original material lists, with names of manufacturers and dealers, can be obtained from our Radio Department upon receipt of postage.

**NEXT MONTH—How to Build a Portable Low-Cost Sound System.** Constructed mainly from materials the average experimenter has on hand, and inexpensive parts easily available, this portable sound system has many useful money-making applications. Also—An Electrical Substitute for a Large Speaker Baffle.

*Lafayette Radio Corp. 1019 W. Lake St. Chicago, Ill.*

*Mayestic Radio Corp. 2600 W. 50th, Chicago, Ill.*





# SHOP NOTES

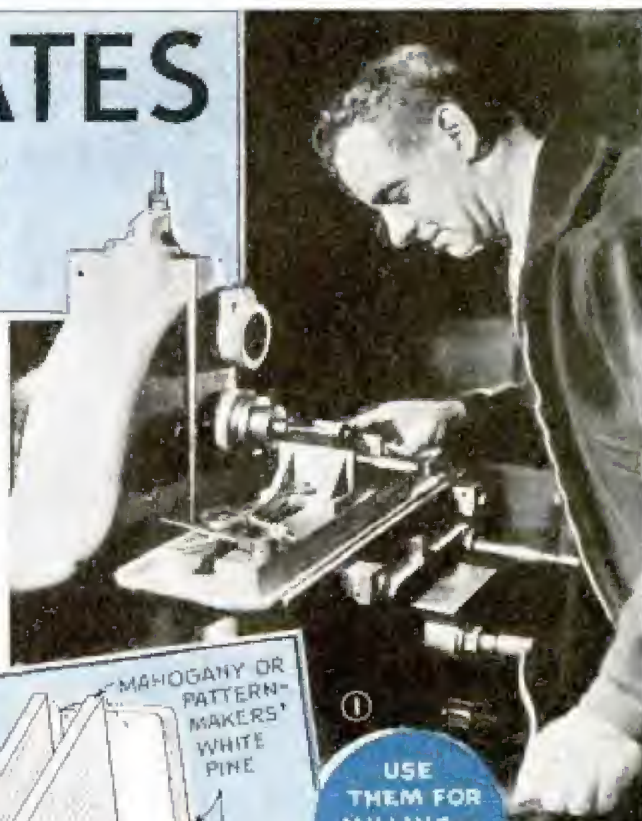
## ANGLE PLATES

*Make them on your own lathe, for difficult set-ups and exacting layout work*

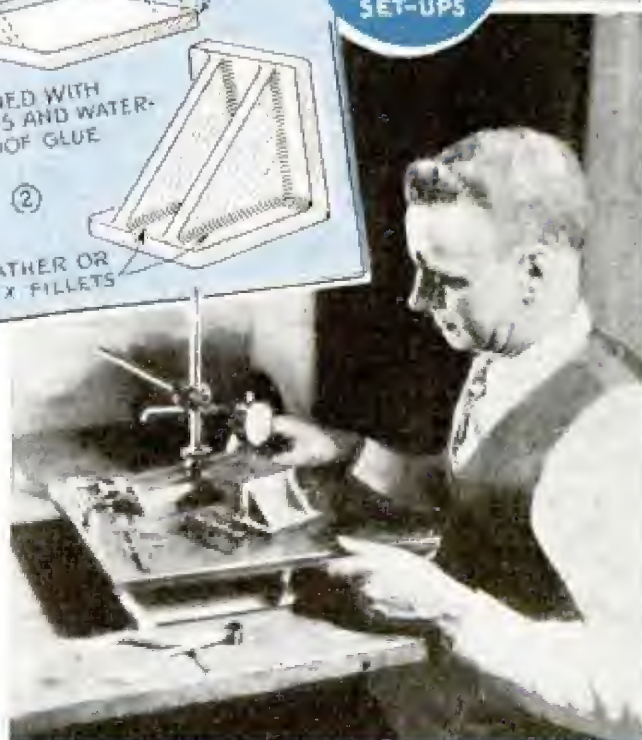
By C. W. WOODSON

NOW and then the run of machine work in the small shop turns up a lathe job that is impossible to chuck in the regular way. Or, it may be necessary to set up work on the milling machine where the ordinary centers, arbors and clamping devices are not at all suitable. Angle plates of several sizes is the answer to these two problems in particular, and besides they have many other practical uses in the shop, in fact, when laying out and machining certain type of work angle plates are almost indispensable. They are easily cast from simple wood patterns, and all the machine work necessary to finish them can be done on any lathe.

The details in Figs. 2 and 5 show dimensions for an angle plate suitable for machining on a 9-in. lathe. Of course, the plates can be made any size to suit your requirements. Being made of cast iron a pattern will be needed. This is a simple job in any close-grained wood such as pine or maple. Fig. 2 gives the details but no sizes are given on the pattern stock. When making up the pattern you have to make an allowance of approximately  $\frac{1}{8}$  in. for shrinkage of the iron casting. To have the gray-iron castings made will be very inexpensive, but be sure you have the work done at a foundry

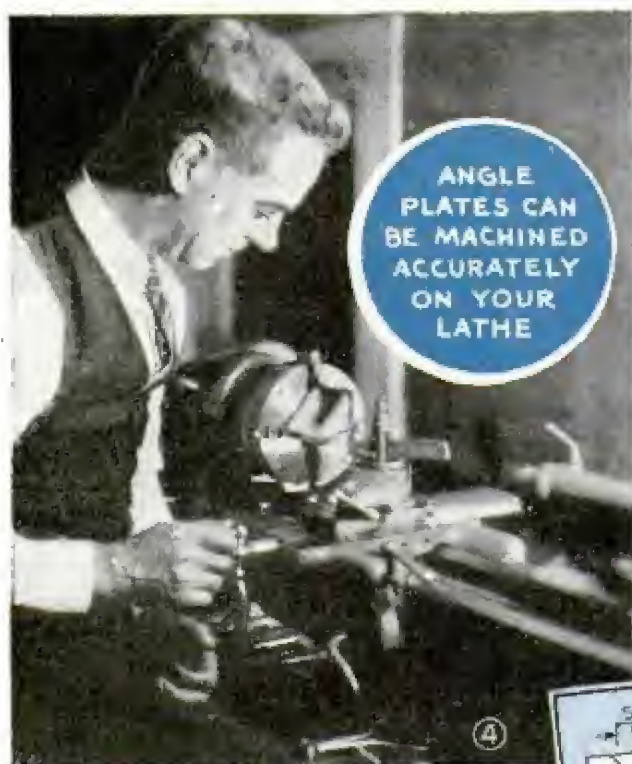


①  
USE  
THEM FOR  
MILLING -  
MACHINE  
SET-UPS



③ CHECKING ACCURACY ON A SURFACE PLATE

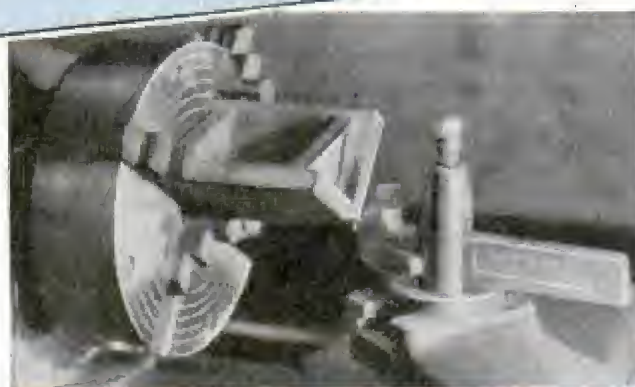
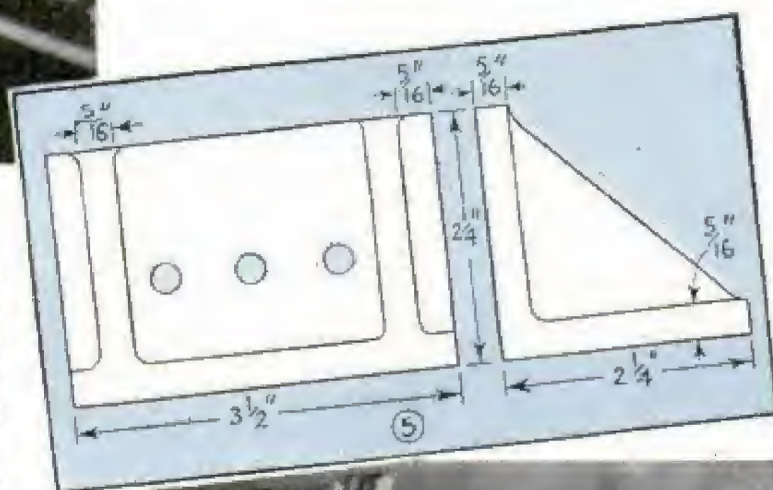




accustomed to handling small castings or the latter may have a hard scale on the surface which is difficult to machine. Of course, if you do have a milling machine similar to the one shown in Fig. 1, machining the castings will be a quick job. But lacking this, you can handle the work nicely on the lathe. The rough casting is mounted in the four-jaw chuck as in Figs. 4, 6 and 7 and both ends are squared by light facing cuts. Then the two edges are machined by chucking alternately as in Fig. 7. The face of one angle plate can be machined while being supported by the other by simply chucking the two plates together, one facing in and the other facing out as in Fig. 11. When the face and edges of both plates are rough finished all over they can be re-chucked and a very light finishing cut taken to square them accurately. Use a gauge while machining the faces to keep them the same thickness, and a toolmaker's square to hold the surfaces exactly at right angles. The faces are finally checked for flatness with a straightedge, Fig. 9, and for squareness with a dial indicator in a manner similar to that shown in Fig. 3. The body holes shown in Fig. 5 are drilled as in Fig. 8. Two coats of light-gray machine enamel will finish the plates ready for use.

Now for some of the jobs you can do with

angle plates. In laying out dimensions, for example, the plates add much to the convenience and accuracy of surface-plate work. An irregular-shaped casting can be held rigidly in place on a surface plate while being marked for machining. Suppose you have rough castings of two model locomotive cylinders which are to be bored exactly the same distance apart and accurately in line with each other. The bolting surface where the cylinders join is machined flat and each cylinder casting in its turn is mounted on an angle plate. The cylinder-hole center is located from this plate and a toolmakers' button adjusted accurately in place. The angle plate with



⑥ FINISH CUT ON THE ENDS

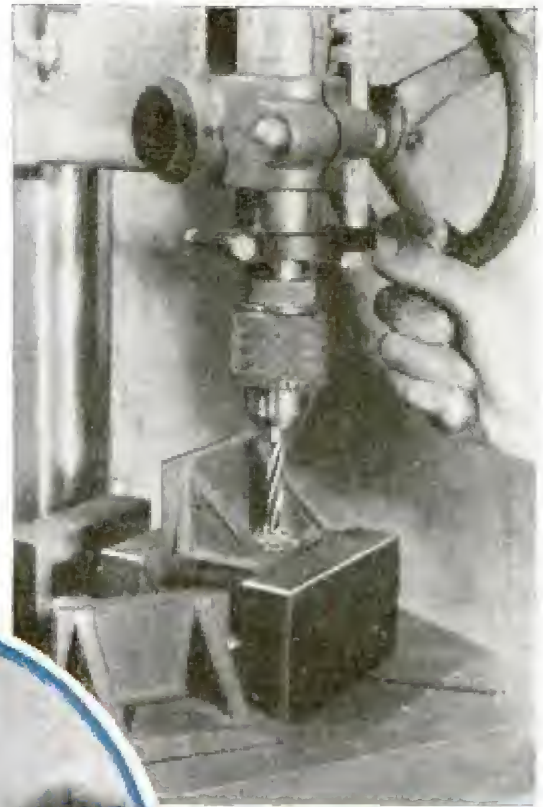


⑦ ON THE EDGES



the work attached and a counterbalance are mounted on the lathe faceplate at the bench, then the whole job is screwed on the lathe spindle. The work is adjusted until the button runs dead true as shown by a dial indicator. This determined, the button is removed and the cylinder hole bored clear through and lapped smooth all in the one setting. The procedure assures definite accuracy both in bore and distance apart, as you do not have to reset the work at any time during the whole operation.

Fig. 10 shows a similar job, a turnbuckle forging being turned down to size for threading. Fig. 1 shows a pair of angle plates acting as a vise for a bit of special work on the milling machine. They are especially handy for this particular ap-



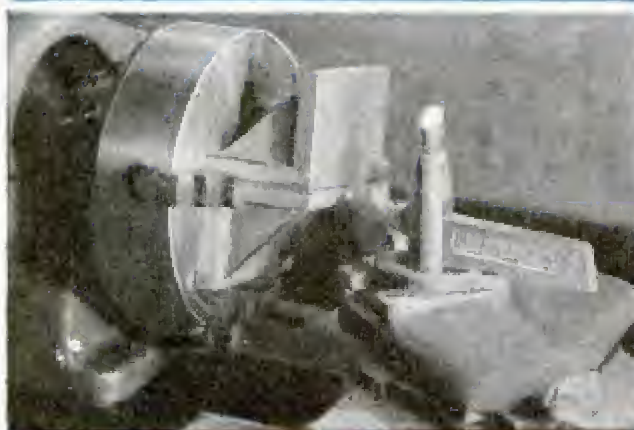
HOLES ARE DRILLED IN THE PLATES FOR BOLTING TO THE LATHE FACEPLATE ⑧



⑩ ANGLE PLATE IN USE ON LATHE



⑨ CHECKING THE JOB WITH A STRAIGHT-EDGE



⑪ FINISH CUT ON THE FACE

plication. One thing to keep in mind about angle plates and their many uses is that it is the accuracy of the faces and edges with one another that counts. Without this precision the plates are useless for any set-up where you must depend on the accuracy of the tools as well as on the layout of the job. For these reasons the plates should be used and handled as you would any other precision tool. Care should be taken not to drop the plates on a concrete floor or knock them against any hard surface which might batter the edges. And, of course, they should be kept oiled when not in use.

### "Pincushion" Shields Pitchfork

Instead of standing a pitchfork in the corner of a feedway in the barn, or leaning it against a manger, stick it in a sack filled with chaff tightly packed. With the tines shielded in this way, there is little danger of injuring your leg or foot on them if the fork should be knocked over unnoticed.



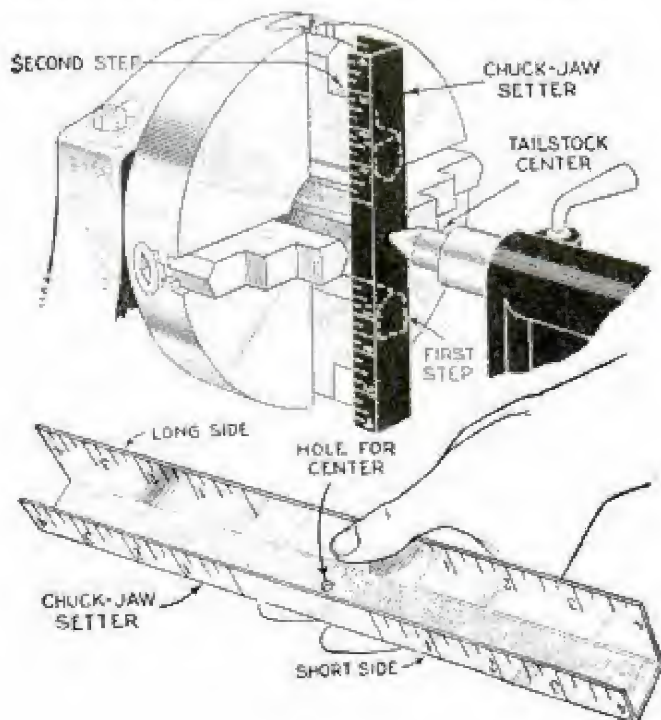
## Movable Shelf on Edge of Barrel Supports Sacks While Filling



To support paper sacks conveniently while filling from a barrel, one grocer uses this shelf, which hooks over the edge of the barrel. The shelf is a small packing box having slots cut in the sides so that it can be inverted to fit over the barrel edge.

## Guide Aids in Setting Chucks Having Four Jaws

While the circular grooves on the faces of four-jaw chucks serve as a guide in set-



ting the jaws uniformly in most cases, there are times when they are of little use on certain work. For this type of work, I use the guide or setter shown. Made of sheet metal, it is bent over on two sides with one side wider than the other. Lines  $\frac{1}{4}$  in. apart are scored on the outer surface of the short side and on the inner surface of the long one. In use, the diameter of the work to be held in the chuck is measured and the guide is put in place and held with the tailstock center. When two of the jaws have been set, the guide is moved to the other two jaws to set them.

—H. Moore, Leeds, Eng.

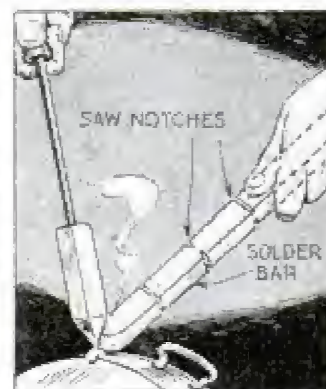
## Stepped Bushing Driver Handy for Various Sizes

Sawed from a piece of flat steel, this simple bushing driver is made easily in any size desired. One end is shaped to provide a handle and the other end is sawed in steps, progressively smaller in size. These should be uniform on both sides, and each succeeding step should be about  $\frac{3}{16}$  in. smaller than the preceding one. The spacing can be varied, of course, to suit work that occurs most frequently.



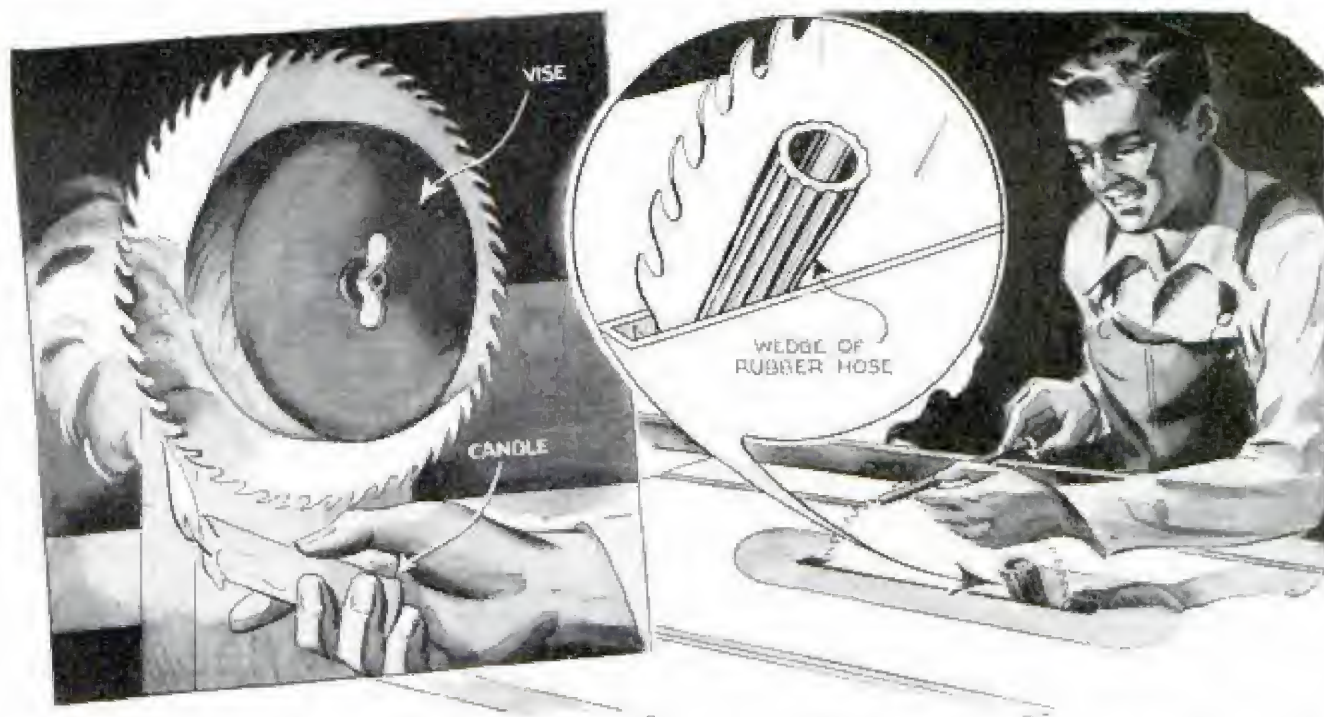
## Cross Slots in Solder Bar Slow Heat Travel

To avoid burning the hand by heat which travels up a bar of solder while holding it on a job that takes some time, one tinsmith cuts slots in the metal as shown. These reduce the heat conveying properties of the metal to a minimum so that the bar can be held longer without being uncomfortable to the hand.





## Shortcuts That Help in Filing Circular Saws



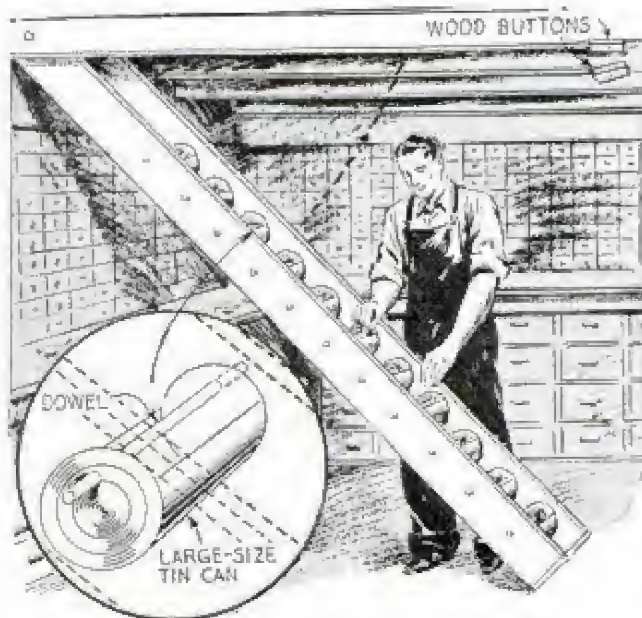
To keep a large circular saw blade from turning while filing it on an arbor, one woodworker employs a wedge made from a short length of discarded hose. The latter is pressed between the blade and the edge of the table insert. Used in this way, the wedge not only holds the blade firmly,

it also deadens the disagreeable screech of the file. Another way that helps immeasurably when filing smaller blades on an improvised vise is to smoke the teeth uniformly with a tallow candle. The blackened surfaces enable one to see the bevels left by filing with far less eyestrain.

## This Small-Parts "Cabinet" Pivots between Floor Joists

One jobbing firm handling thousands of small items solved the storage problem by building a novel cabinet between the ceiling joists in the storeroom. The cabinet is simply a long wooden box closed at both

ends and fitting between the adjacent joists as indicated. One end is pivoted on a 1-in. dowel while the other end is held flush with the ceiling when the cabinet is closed by means of wood turn buttons. Swinging holders or trays made from large-size tin cans are pivoted on dowels between the sides. Each can has a part of the curved side cut away to form a tray with a round bottom. Swinging freely as they do, the trays are always level whether the cabinet is in the closed or open position.

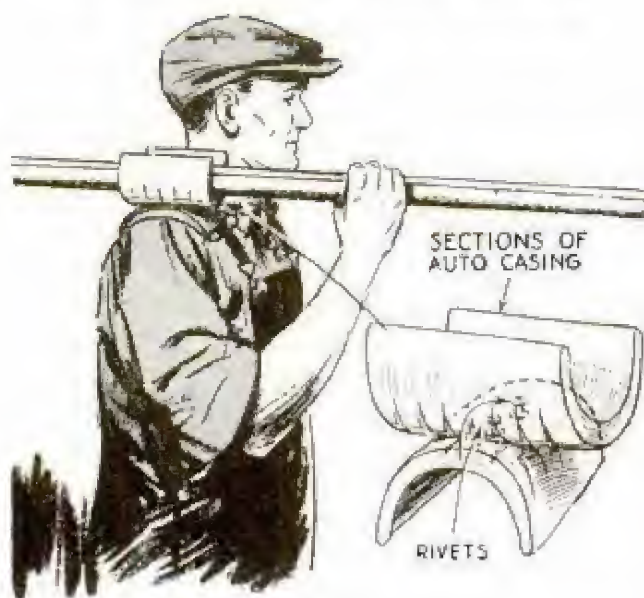


## Protecting Idle Farm Implements

Farm implements that are not housed, especially during hot summer weather, should be given protective coatings. The wooden parts can be covered with creosote, and the metal parts should be coated with oil several times each year. A cloth fastened to the end of a stick is handy for applying the oil or creosote.



## Shoulder Saddle to Carry Pipe Is Made from Auto Casing



Plumbers and others who have occasion to carry lengths of heavy pipe will find that this saddle provides a comfortable shoulder pad. It is made by riveting two sections of auto casing together.

## Non-Slip Top for Paper Trimmer

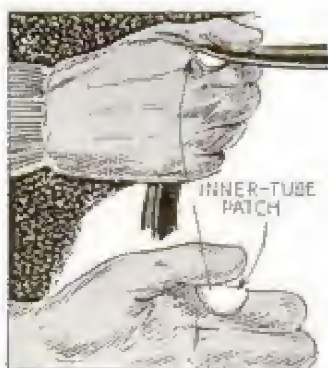


As the surface of a paper trimmer is often so smooth that work is difficult to hold without it moving, one workman made the table skidproof by applying a light coat of rubber cement.

This provides a pliable coating on which it is very easy to hold paper.

## Rubber Patches on Cotton Gloves Grip Driving Lines

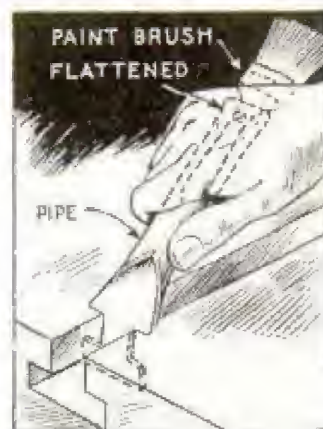
Farmers and others who drive horses while wearing cotton gloves will find that they can grip the lines firmly if an inner-tube patch is placed over the forefinger of each glove as



indicated. This tends to reduce muscle strain as the rubber permits holding the lines without gripping them tightly.

## Cleaning T-Slots in Machines

Operators of lathes, planers, milling machines, etc., will find this T-slot cleaner a timesaver. It is a piece of pipe or tubing flattened at one end and then cut to fit in the slot as indicated. The other end is flattened slightly to take the handle of a small paint brush, which is screwed into place.



## Paper Dishes Hold Chemicals on Balance Scales

When weighing small quantities of chemicals on your balance scales, paper plates will serve very nicely as containers.



These are available in several sizes and may be thrown away when the weighing is finished, eliminating the possibility of small children or animals coming in contact with any poisonous chemicals.

¶ If you have an idea that might be used for a short article in these pages, send it to the Homecraft Editor. Inclose a snapshot or drawing and give all the necessary information in as few words as possible. To be accepted, material must be of general interest and different from any we have published previously.





SIMPLE EQUIPMENT PRODUCES DISTINCTIVE SUEDE FINISH IN BRILLIANT COLORS ON NOVELTIES, STATUARY, TOYS, LAMPS, FURNITURE, PILLOWS AND MANY OTHER ARTICLES.

# "FLOCK"

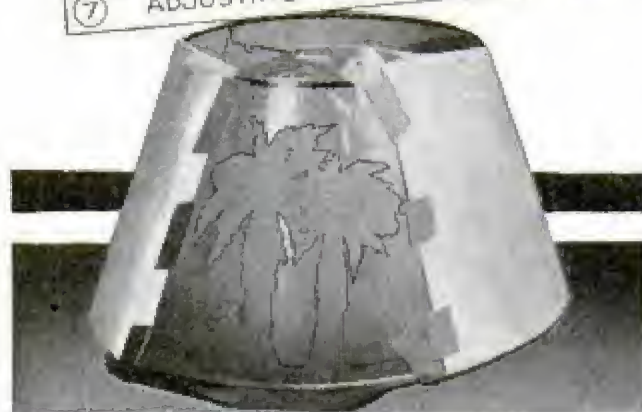
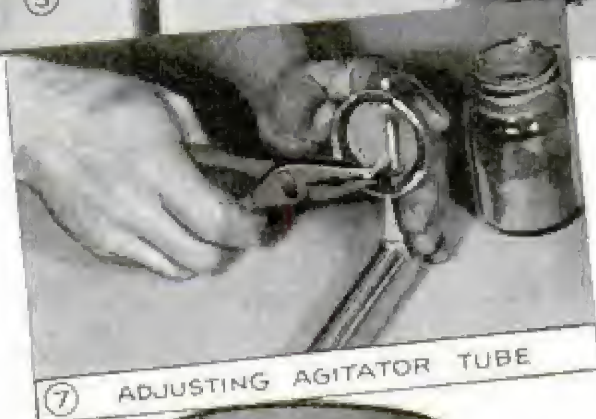
*New finish is soft, pliable and waterproof*

**F**LOCK is made from silk, wool, cotton and rayon fibers, and is applied by spraying or sifting onto a varnished surface to which the cloth fibers adhere, producing a beautiful velvety-soft surface which is pliable, waterproof and colorful. The flock fibers range in length from  $\frac{1}{8}$  to  $\frac{1}{2}$ -in., the short fibers being best suited for homecraft use. Products which can be finished attractively with flock include toys, and furniture as in Figs. 1 and 2, also statuary, boxes, shoes, card tables, pillows, radio cabinets, lamp bases, and others.

Apply a priming coat first. This can be brushed or sprayed and is in no way special, but simply a priming coat. Fig. 3 shows a priming coat of white lacquer being sprayed. The second coat is the binder. This can be paint or colored varnish. For a first-quality job, the regular manufactured binder made especially for this work should be used. The binder should be the same color as the flock. Fig. 4 shows the binder being applied. The flock is applied immediately after the binder coat, as shown in Fig. 5. An inex-







pensive flock gun can be used, or, the work can be coated by sifting, as shown in Fig. 11. No special skill is required—the flock is simply sprayed or sifted onto the work until the binder catches a full coating. The work should be done on a clean surface so that flock not actually deposited on the work can be swept up and used again.

The simple mechanics of the flock gun are shown in Fig. 6. Air from a small compressor or from a rubber hand bulb enters the gun at the inlet tube. Part of the air current is diverted into the agitator tube, and the air current from the agitator tube blows the fluffy flock to the top of the jar where the main air current expels it. The air current at the end of the agitator tube should be reduced to the smallest amount required to agitate the flock, reserving the greater part of the air to expel the flock. On production-type flock guns, air pressure is controlled by a valve. On light-duty equipment, adjustment is made by fit-and-try methods, using a pair of pliers to close the end of the agitator tube, as shown in Fig. 7.

Application of flock in two or more tones of color, stencils, borders, etc., follows the same general practice used in ordinary painting. A simple example is the lamp shade shown in Figs. 8, 9 and 10, which is decorated with a silhouette in bright red flock. The design was first drawn on tracing or "frisket" paper, after which the paper was rubber-cemented to the lamp shade, as can be seen in Fig. 8. A stencil knife was used to cut away the areas to be flocked. Fig. 9 shows the flock being applied after the design was coated with binder. In this particular case the stencil was not lifted but remained in place until



*or apply it by sifting*

flocking was completed. It can be seen, however, that after spraying the binder through any metal or oiled-paper stencil, the stencil could be lifted immediately for the application of flock. Fig. 10 shows the finished silhouette.

Instead of using a stencil, designs and color work can be done by brushing the areas as required and then flocking, working the colors one after the other. Fig. 12 was flocked in this manner. The



main body color (light brown) was worked first, applying brown binder and then brown flock. The black areas were next painted with black binder and flocked, followed by the red coating on the tongue. As

in painting, the preceding coat must be given time to dry before another coat can be worked.

Shading can be done by spraying a base coat of flock, touching this up when dry with a suitable color of aniline dye, sprayed on. Flock of one color also can be sprayed over flock of another color. The binder in this case should be clear lacquer, thinned with a retarder thinner, with about a half-teaspoonful of castor oil per pint added to further retard drying. Both silhouette and color work on flat surfaces can be done by using the silk screen process to apply the binder.

After the finish has dried 24 hours, it should be brushed down with a stiff brush, Fig. 12. This will set the nap and remove any loose flock that may be clinging to the surface.

## New Top for Old Bridge Table Is Made from Plywood and Canvas

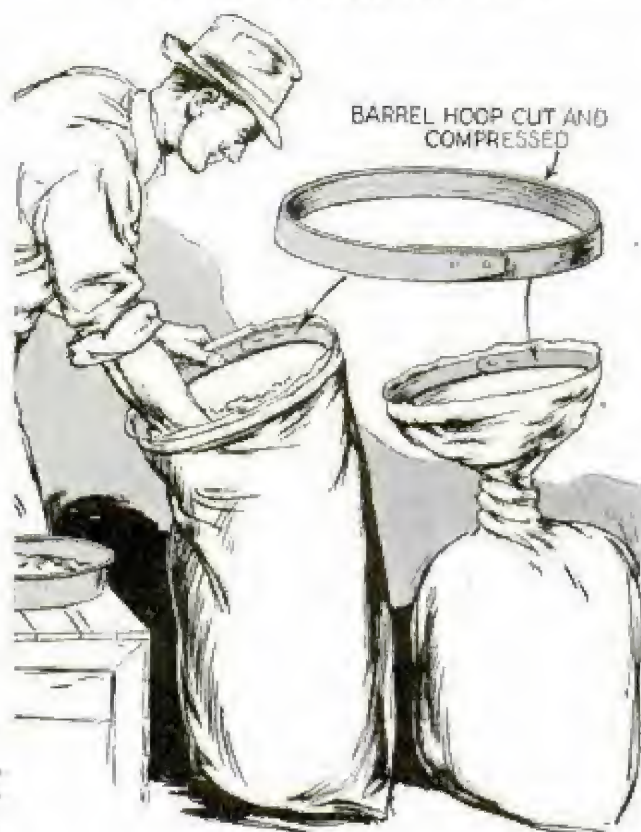
Why discard a bridge table that has become rickety when it can be repaired with a piece of  $\frac{1}{4}$ -in. plywood and a square of canvas? First remove the old top and tighten the legs and braces. Then cut the plywood to replace the top, and round the edges to a neat fit. If this is done carefully, the top will help brace the table. Cover the plywood with two thicknesses of an old blanket or similar heavy cloth, and over this stretch the canvas. Fold it carefully over the edges and tack it on the underside. Replace the metal corner pieces taken from the old top.

—Chas. H. Deerwester, Middletown, Pa.





## Sack Opened or Closed by Hoop Avoids Waste of Feed



If you dispense feed to live stock or poultry from sacks, waste of the feed by spilling can be avoided with a small barrel hoop in the mouth of the sack. This keeps the sack open for easy removal of the contents, and permits it to be closed instantly by twisting the hoop.

## Artist's Ruler Has Handle on End to Outline Showcards Quickly

To manipulate a ruler rapidly while laying out showcard designs, one artist at-

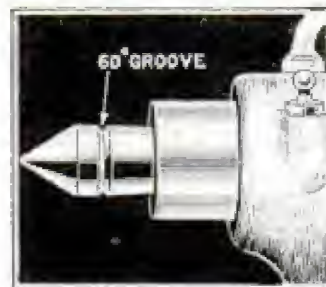


tached a tablespoon handle to it. A slight forward pressure on the handle holds the ruler firmly against the work, and the handle being at the extreme end allows full length of the edge for marking.

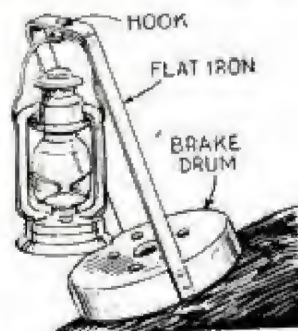
## Gauge Cut in Tailstock Center Sets Threading Tool

I find that a 60° groove cut in the tailstock center in the position indicated saves time when setting up a threading tool on a lathe. After mounting the work to be threaded between the centers, the tool is set quickly by adjusting it to fit in the groove correctly.

—D. D. Guthrie, Alamosa, Colo.



## Supports Hold Warning Lanterns on Sloping Surfaces

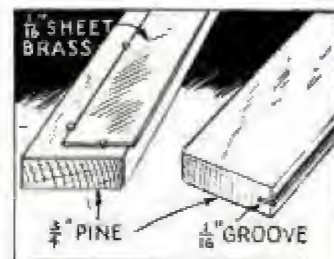


When warning lanterns have to be placed on sloping surfaces, one contractor uses supports like the one shown which hold the lanterns in vertical positions. Each support consists of

a discarded auto brake drum to which a U-shaped length of flat iron is bolted or riveted to take the lantern bail.

## Squaring Edges of Sheet Metal When Cutting Narrow Strips

On a job that required a number of narrow strips of sheet metal that had to be perfectly flat with the edges square, the metal was cut on

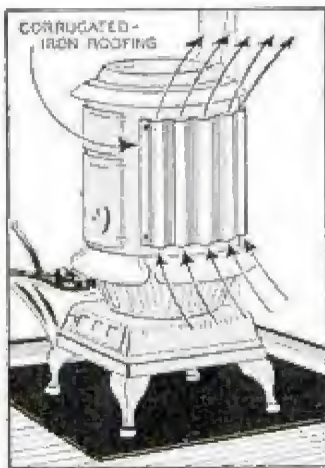


a power hack saw with these jigs. First a piece of the metal was fastened to a wood straightedge with nails at the ends and one side so that the other side extended beyond



the straightedge a little more than the width of the strip to be cut. Then an emery-faced disk was put on a circular saw and the projecting edge of the metal was squared, using the saw fence as a guide. Next, the required strip was cut from the metal, making it slightly oversize to allow for squaring up the edge on the emery disk. To hold the strip for this job, a shallow groove was cut in a straightedge to take it, the straightedge being held against the fence as the edge of the strip was fed into the emery wheel.

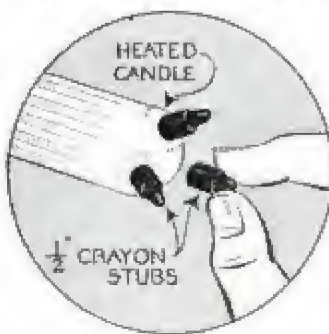
### Shop Stove Improved by Casing of Corrugated Sheet Iron



Owners of small shops and garages who heat their buildings with stoves can improve the efficiency of the latter by encasing them with corrugated sheet iron as indicated. Air will circulate rapidly between the surface of the metal and

stove, and the casing will also tend to reduce fire hazard if the stove must be placed near a wall.

### Candle Holds Stubs of Crayon



An artist who had to turn out a number of duplicate crayon sketches in a hurry, used a candle to hold the three crayons required, so that to change from one color to

the other all he had to do was turn the candle slightly in his hand. Stubs of the crayon were used and they were stuck to the ends of the candle by heating it.

Two adjustable metal window ventilators, one covering the other, make an inexpensive light-trap ventilator for the photo darkroom.

### Steel Barrel Rolled Over Flames Smothers Fire



A Wisconsin farmer who has occasion to burn certain areas of wild grass from his pastures each year, keeps the fire under control by rolling a barrel over the flames to smother them where desired. A length of wood pivoted to each end of the barrel at the center permits it to be manipulated.

### Turkey Feed Boxes Kept Clean with Wires Between Ends

To prevent turkeys from getting on the edges of feed boxes, one poultryman stretches wires above the boxes and fastens them to supports as indicated. As the birds are likely to fly up on the wires causing them to sag, he inserts small coil springs, which keep the wires taut.







By ALEXANDER MAXWELL

**S**HADOWLESS illumination of an intensity that can be varied to suit the requirements of the work is of utmost importance in any shop. Illumination of ten foot-candles is barely enough for reading newsprint and light of 25 foot-candles is needed to read the average mail-order catalogue. Exacting work like tool-grinding and engraving should not be attempted with a light less than 30 foot-candles while a light of 50 foot-candles is much better.

Metal-turning requires almost six times as much light as cabinetmaking and the high reflection of polished steel must be subdued. Light from an exposed filament-type lamp is just about as hard on your eyes as glaring sunlight and it produces dazzling high lights and black shadows. If that light is first directed against a white surface and then reflected back on the work, the glare disappears and, strangest of all, the shadows also shrink in size and become almost imperceptible. Why the shadows shrink is clearly illustrated in Fig. 4. Fig. 7 shows what illumination you get from 60, 100 and 150-watt lamps of the usual filament type. These figures are average, for individual lamps vary, depending on age, line voltage and make. Note particularly how much light intensity drops as the distance from the lamp increases. While your eyes may not notice this, the nervous system soon will give evidence of it, if you work in a twilight zone for any length of time.

Light intensity is measured with a photoelectric cell, Fig. 3. This little device is very sensitive, and also expensive. There is no need to purchase one, for if you obtain your power from a utility company, the chances are that they have one, which may be borrowed for the asking. Lighting by guesswork has gone completely out of fashion. It is now the policy of all power and light companies to actually measure



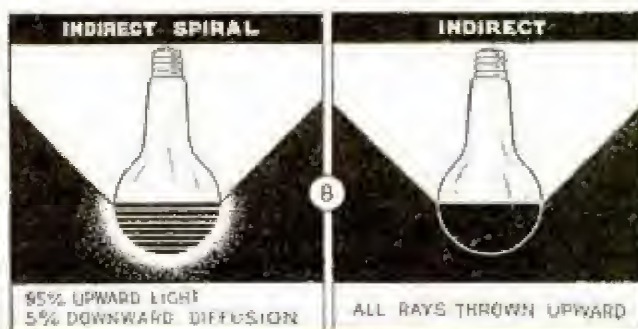
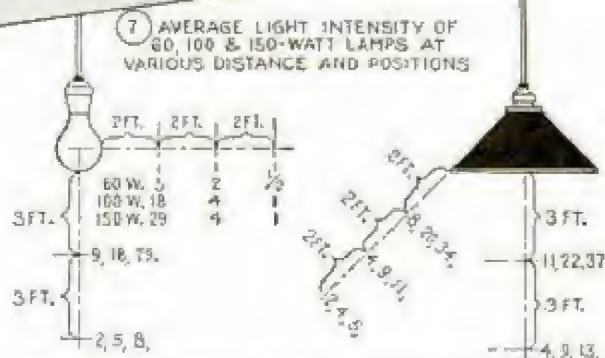
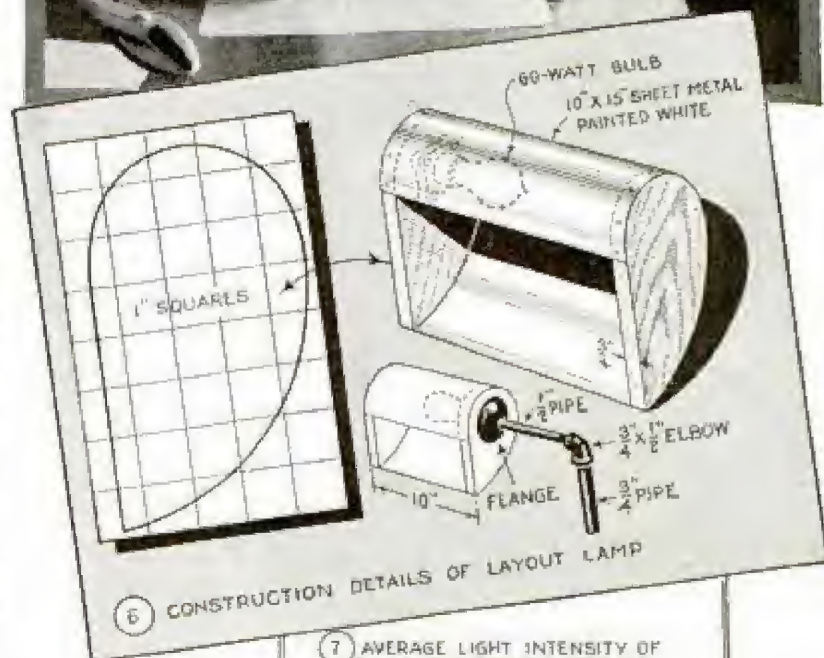
# LIGHT..

## *eye strain*

lighting requirements in the rooms of office buildings, schools, factories and even private homes. The result is a more intelligent use of light at a great saving in jangled nerves, eye strain and reduction of industrial accidents.

Lighting requirements for any workshop are almost like those for industrial plants, only on a less elaborate scale. Cost is not prohibitive. The very best factory-made fixture costs no more than a set of good carving chisels. Even that may be cut down considerably by making your own, for the beautiful part of present methods of lighting is simplicity. The most important single item is a can of white paint. A white surface does not absorb light and is therefore an excellent reflector. Flat white, casein-base, cold-water paint is preferred. It sticks to plaster, wood and metal and may be mixed as needed. When soiled it may be sponged lightly without danger of lifting.

The simplest indirect lighting unit consists of a white ceiling and one or more silver-bowl lamps, Fig. 8. These have a built-in reflector, and are ideal for indirect lighting. If your workshop ceiling is of open-joist construction, you can nail sheet tin in an arc between the joists, as shown in the lower detail of Fig. 15, but for high-ceiling rooms, a canopy fixture like the one shown in Figs. 1, 2, 11 and upper details of Fig. 15, may be necessary. A canopy of this type can be made of sheet metal although hard-pressed board is satisfactory. The length of the canopy and number of lights to use in it depend upon your individual requirements. Always keep in mind the limited carrying power of the average light bulb. Instead of fila-

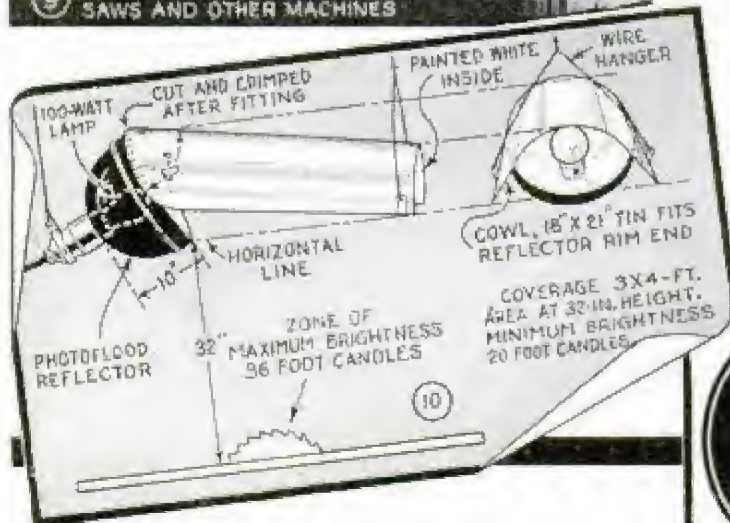




## SUFFICIENT LIGHT WITHOUT GLARE OR SHARP SHADOWS



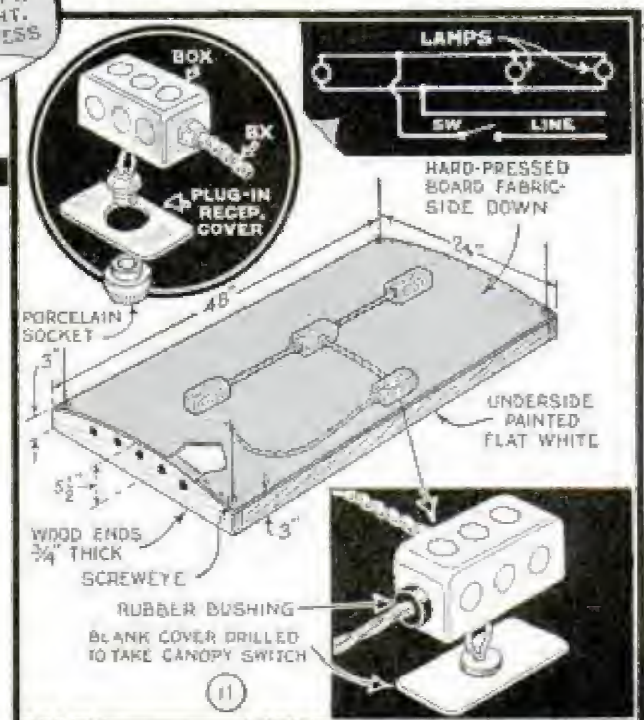
9 SHADOWLESS LIGHT FOR WORKSHOP  
SAWS AND OTHER MACHINES



ment lamps you can use the new type of fluorescent lamps if desired. The width of the canopy varies: If it is suspended 3 ft. over the workbench, the width should be 24 in. The best method of suspension is to use wires from the ceiling to the four corners of the canopy. Make it any length to cover the workbench from end to end, spacing the lamps equidistantly. You should use outlet boxes and flexible conduit for wiring, fitting the boxes on the top of the canopy as shown. Silver-bowl lamps are installed and a glare shield is provided

around each lamp. Dimensions of the shield and the method of attachment are shown in the upper detail of Fig. 15. At both ends of the canopy, holes are drilled to permit adequate ventilation. More power-machine accidents are traceable to poor lighting than to any other cause according to insurance reports. Therefore a good light for your circular saw is important. Figs. 9 and 10 show a fixture which quickly and inexpensively solves the problem. There is no glare and the entire saw table is evenly illuminated and the whirling blade is highly visible. The fixture is made of a photographic reflector and a sheet of tin. Although simple to make, it must be adjusted carefully to get the maximum benefit of the reflected light. This particular fixture is especially helpful where the saw table is polished smooth and bright, as most of them now are, and where fine work is being done which requires that measurements on the stock and adjustments of the machine be made a number of times as the work goes along. If the direct rays of a bright light reflect from such a table surface into your eyes it is virtually impossible to set the saw accurately when doing close work.

A layout lamp for metal work is

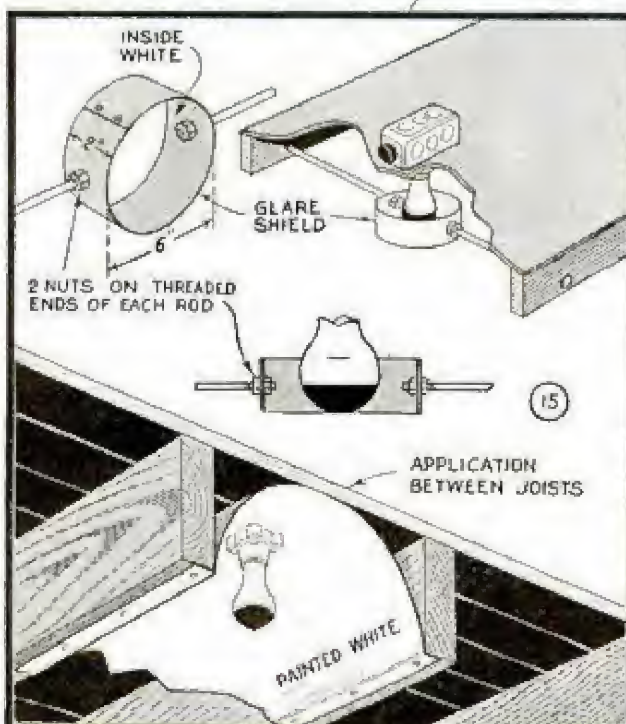
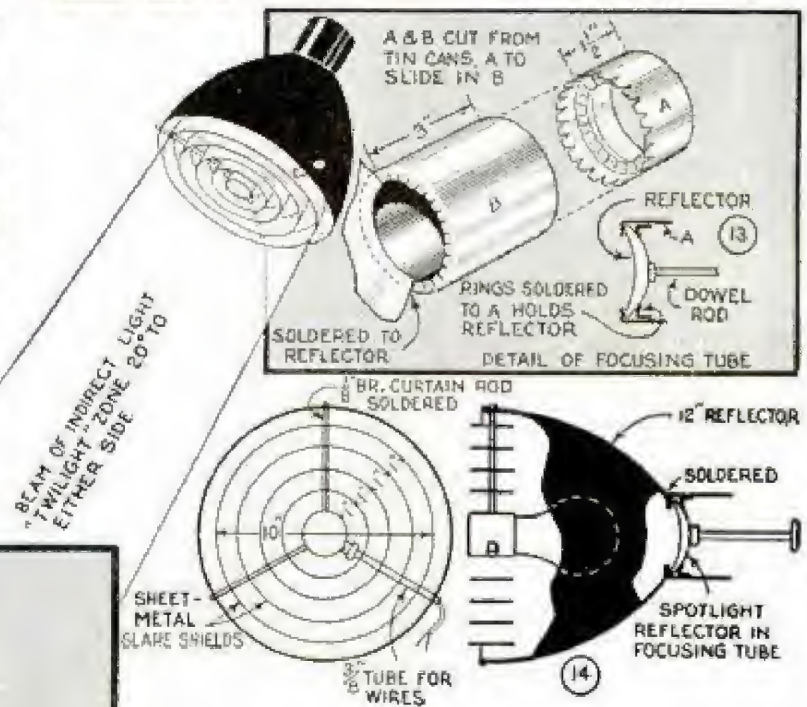




# ESSENTIAL IN EXACTING WORK WITH TOOLS AND MACHINES

shown in Figs. 5 and 6. A horizontal beam of reflected light throws the scriber line into relief and at the same time subdues the natural tendency of the metal to flash and sparkle. This light is also very good for checking surface irregularities. It makes the scraping and sanding of table tops and work of similar nature a simple job. The unit should be mounted rigidly on a pipe stand-ard so it can be raised and lowered and thrust well toward the middle of the cutting bench.

For close, accurate work, such as metal-turning and modelmaking, a condensed floodlight, as shown in Figs. 12 to 14 inclusive, is useful. With it a strong beam of light can be cast on the hands and the work while the eyes are in twilight. The reflector shell is cut from a 12-in. photo lamp and the tiny concave mirror may be the reflector from an automobile spotlight, magic lantern, or maybe an aluminum bowl. It should be adjustable for different size bulbs. Note that the ad-



justable feature is obtained by using two tin cans, one sliding in the other. A ring is soldered inside the smaller one and the edge of the can is serrated and bent back so that the reflector is retained snugly between ring and bent edge as in Fig. 13. A number of concentric bands of sheet metal, arranged as shown, provide non-glare shields, causing the light to be directed in a comparatively straight beam that has a "twilight" zone 20° to either side.

❏ When you need a piece of fiber for an electrical or similar project you can cut it from a ten-cent fiber chair seat.



## Puddling Shovels Assembled from Disk-Harrow Blades



Needing a number of shovels to loosen sand and gravel for a mud-pumping barge, a contractor made good ones from the blades of an old disk harrow by fitting them with pipe handles. The pipe was split back about 5 in. from one end, the halves curved to the contour of the blade, after which they were heated and flattened. Then holes were drilled and the handle was riveted to the blade.

## Mailbox Like Prairie Schooner

Can lids for wheels, and four cut-outs of horses hitched to one end give this rural mailbox the novel appearance of a prairie schooner. The box is mounted on two wood blocks, which are supported by a 1 by 6-in. board nailed to the top of a post, the wheels being pivoted on nails driven into the bottom of the box. Horses, tongue



and doubletrees are cut from 1/4-in. wood, while the harness is small strips of leather. Painting the assembly in appropriate colors adds to the realistic appearance.

## Extension Light Held in Spring on Workbench

To support the bulb of an extension light in a convenient position for working on a bench, a mechanic uses a coil spring obtained from a discarded auto cushion. The spring is also handy to keep the lamp out of grease and oil when used under a car or on the workshop floor.



## Work Centered on Faceplate with Aid of Microscope

A simple and accurate method of locating and centering work on a lathe faceplate is to use an inexpensive low-power microscope. With it, you can lay out work

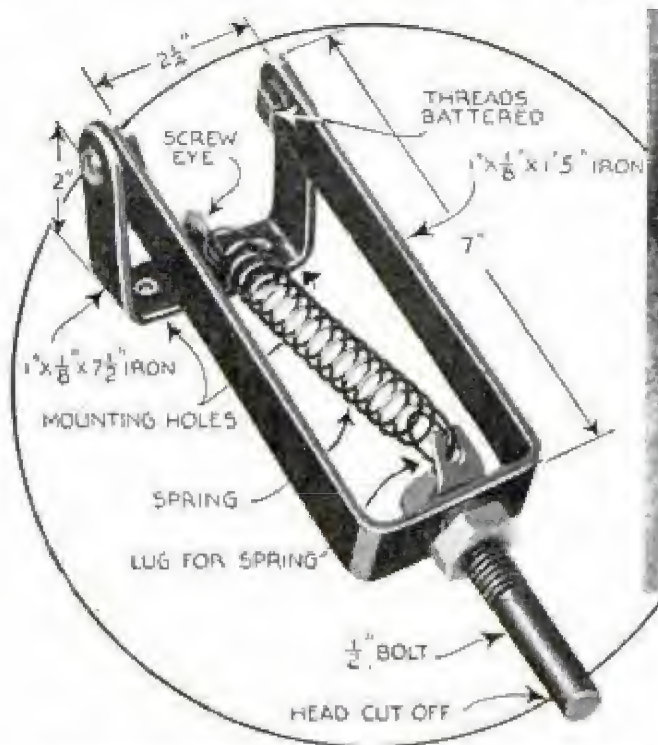


with a scale, scribe, and magnifying glass, set it up and drill and bore it without any further operations such as are often necessary when using a dial indicator. The microscope is clamped on a rod, which is held in the tool post, and can be set up at any convenient angle.

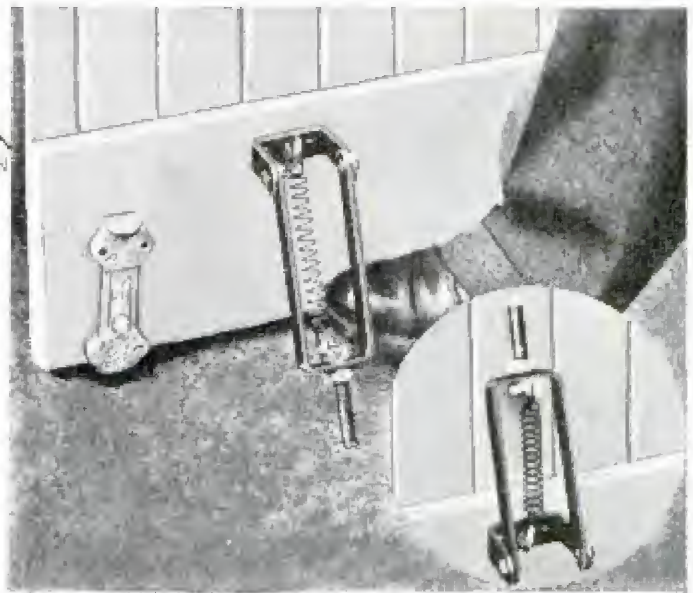
—J. D. Brubaker, Evanston, Ill.



## Foot-Controlled Toggle Stop on Garage Door



Stooping is unnecessary when you raise or lower this doorstop. It is snapped up



or down with your foot, and there is no chance of wind closing the door, as the harder the door is pushed against the stop the more firmly it bites into the ground. It is made of flat iron bent and assembled as shown in the detail.

## Gear-Lubricant Can "Pumped Up" to Fill Transmission

Motorists who would like to change their own gear lubricant but hesitate to because of the difficulty in filling the differential and transmission, can do the job easily by using a tire pump to build up a low air pressure inside the grease can. The can must have a compression lid so that a pressure of 2 or 3 lbs. will not loosen it. Punch two holes in the lid of the can. Solder a tire-valve stem in one hole and a 15-in. length of  $\frac{1}{2}$ -in. copper tubing in the other so that the lower end projects within  $\frac{1}{4}$  in. of the bottom. The end of the tubing that extends from the lid is bent to form a spout. After the old lubricant has been drained from the differential or transmission, the spout is inserted in the refill hole and the pump is used to force the grease into the housing. It may be necessary to heat summer grades of lubricant to make them flow easily.

—Robert J. Williams, Chicago.

¶ If a windshield-wiper blade scratches the glass, the tiny grooves can be removed by rubbing them with a piece of felt and polishing rouge. Most hardware and paint stores have the rouge in paste form.





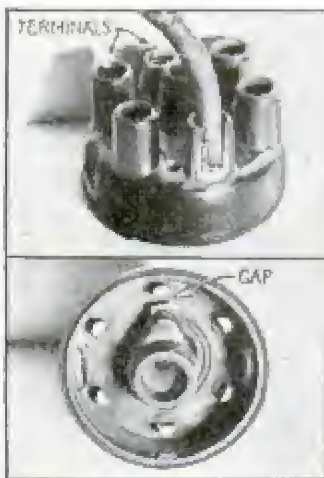
## Section of Auto Tire Shapes Inner Tube When Buffing



To hold an inner tube safely against a wheel while buffing it before applying a patch, one mechanic uses a section of tire shaped as indicated as a holder. The portion of the tube to be repaired is stretched tightly over the holder.

## Causes of Weak Spark at Plugs

Often the ignition coil is blamed for a weak spark at the plugs when in reality the trouble is in the distributor. The terminals where the spark-plug cables enter the distributor often corrode and set up a high resistance against the passage of current. This trouble can be overcome by pulling out the wires and cleaning the terminals and the copper caps on the ends of the wires. Another place where trouble



may originate is the spacing between the rotor inside the distributor and the contact points of the cap. In time the end of the rotor or the contacts may corrode or

burn so that the gap between them is increased considerably. This tends to set up a resistance to the current. While the best remedy for this trouble is to install a new rotor and cap, a repair can be made by building up the end of the rotor with solder. After doing this the rotor is turned over slowly to shear off the excess solder and give the proper clearance.

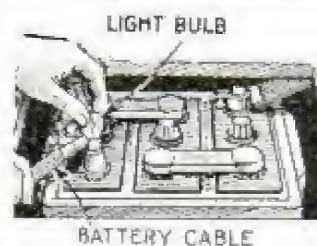
## Locating Stuck Valves

Weak valve springs and sticking valves account for a lot of motor trouble, and can be located with nothing more than an ordinary screwdriver. To do this, remove the valve cover plate, and with the motor running, increase the spring tension of each valve in succession by spreading the coils with a screwdriver. While this test is being made, it is well to have a vacuum



gauge connected to the motor. A higher or steadier reading when the screwdriver is inserted into the spring indicates that the latter is weak or that the valve is sticking. In serious cases the improvement can be noted by merely listening to the difference in operation of the motor as the springs are tested.

## Checking Car for Short Circuits Before Installing Battery



When a battery is removed from a car for charging, I always make a check for short circuits before installing the rental battery. This is done easily by tightening one terminal to the battery post and then holding the other terminal against the metal stem of a



single contact bulb, which is held on top of the other post. If the bulb glows after all switches on the car have been opened, there is a short circuit in the wiring, which should be repaired. I find that most customers appreciate this service because it prevents their own battery from being discharged when it is returned to the car, and it often gives me extra business in locating and repairing the short circuit.

—Milton Mitz, Milwaukee, Wis.

## Easy Way to Change Valve Spring



It is an easy matter to change valve springs without removing the cylinder head if you use compressed air to hold down the valve while removing and replacing the

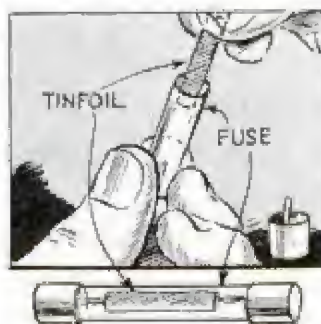
keepers. A fitting for the air-hose nozzle is made from an old spark plug by removing the porcelain core and soldering a valve stem to the spark-plug shell. In use, the regular spark plug is removed and the fitting screwed into place.

—C. E. Packer, Chicago.

## Emergency Fuse Has Foil Core

If it is necessary to substitute a piece of metal foil for a burned-out auto fuse in an emergency, pull a cap off the end of the latter and insert the twisted foil. When the cap is replaced, the short pieces of fuse wire remaining will contact the foil and make a better repair than the usual method of wrapping the foil around the entire fuse.

—Wesley McDonnell, Silverton, Ore.



❑ If battery acid is accidentally spilled on the upholstering cloth of a car, a solution of baking soda and water or household ammonia immediately sponged over the spots will neutralize the acid and keep it from eating holes in the material.

## Damp Sandpaper Removes Hair from Auto Seats



Dog hair and fine lint can be removed from auto seats easily with dampened sandpaper. This tends to mat and roll the hair, as the paper is moved over the upholstery, so that it can be picked up.

## Grease Retainers Need Care

Felt washers used to retain grease on universals and in dozens of other places may be damaged easily by careless use of high-pressure greasing. On many universal joints two openings are provided, one to serve as a grease connection and the other to act as a vent for relieving the pressure. If this is not the case, great care should be taken to control the pressure so the gasket will not be blown.

## Heater Switch Dims Fog Lights

Noticing that fog lights on some cars that I met were too bright for comfort to the eyes, I installed a dimmer switch on my lights to use when meeting another motorist. The switch was one of the rheostat type used to control a car heater.—F. J. Kirby, Boise, Idaho.





## Ratchet Handle Good Substitute for Ford Crank



If you have to start a Ford motor with the two-piece crank and should lose the handle part of the crank, the ratchet handle of a socket wrench set will serve the purpose. This will slip over the squared end of the extension part of the crank as

shown. The ratchet handle is sometimes preferable to the original handle as it permits backing the crank without removing the extension rod.

## Repairing Windshield Wiper

A permanent repair for a vacuum-type windshield wiper that acts erratically because of a leak around the shaft, can be made in the following way: Take the wiper apart and file the bottom or lower half of the housing evenly to allow less clearance for the wiper shaft when the two parts of the housing are reassembled. Then clean out the wiper, oil the moving parts, and reassemble it. If the wiper jams, it means you have filed off too much. When this happens the use of two paper gaskets, instead of the usual one, between the two parts of the housing will overcome the trouble.—E. J. Novak, Omaha, Nebr.

## Spare-Time Profits in Window Boxes



Three attractive designs of boxes having the same basic construction but varied in appearance by means of molding, overlays, and curved ends. All have zinc linings for durability

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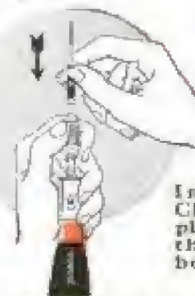
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PM



# Modern Precious Metals

(Continued from page 575)

is an important constituent of stainless steels. Beauty, great strength, light weight and resistance to corrosion are desirable qualities of these steels that make them so much in demand for streamline trains, cutlery, building construction and the like.



By careful rolling, aluminum foil as thin as .00025 inch can be produced. It has many industrial uses.

Although the United States used more than 550,000 tons of chromium ore in 1937, domestic production was less than 5,000 tons.

We have all admired a shiny Buffalo five-cent piece, and some of us have seen the Jefferson nickel. It is doubtful that, for most of us, our knowledge of nickel has extended much farther. Yet in our fast-moving lives, nickel is indispensable. Before and during the World War nickel was the danger metal, used almost entirely in instruments of destruction, such as battle-ship armor and steel-pointed projectiles. Since the war nickel has become one of our greatest safety metals.

When you are stalled in your car on a sharp curve and a ten-ton truck approaches at fifty miles an hour, you wonder if the driver can stop. Well, if the truck is equipped with nickel-chromium iron brake drums, he can. Manufacturers

have found these drums resist scoring and frictional heat well and have a long life.

In the San Francisco-Oakland Bay bridge, several thousand tons of nickel steel were used for cantilever tie pins, anchor plates, parts that "must not" fail from corrosion, weight or earthquake shocks. Nickel cast iron, too, is coming along fast. Fly-wheels, cylinder linings, brake drums and a host of other cast-iron products are benefited by small amounts of nickel.

Magnesium, frequently called the wonder metal, has been used for years in chemical industries and fireworks manufacture. Recently it has entered metallurgical fields. One finds alloys of magnesium and aluminum varying all the way from two per cent aluminum and ninety-eight per cent magnesium to three and five-tenths per cent magnesium and ninety-six and five tenths per cent aluminum. One standard alloy—six per cent aluminum, three per cent zinc, two-tenths per cent manganese and the balance magnesium—is widely used for castings where strength and very light weight are required. Only two-thirds as heavy as aluminum and one-fourth as heavy as cast iron, this alloy rivals both in strength and durability. For buses, airplanes, portable electric drills and castings of many varieties, magnesium alloys are particularly valuable. Through use of such alloys, the weight of a bus was reduced four tons from that of steel construction without, it is claimed, sacrificing safety or durability.

Molybdenum, the tough metal, when added in small amounts to steel or cast iron, results in products that resist abrasion to a remarkable degree. Everything from hand shovels to steam shovels and bucket dredges benefits from its use. Armaments, high-speed tool steel and structural steels requiring high-tensile strength all demand large quantities of molybdenum. It alloys easily with chromium, nickel, tungsten, and manganese to make tough, hard steels. A little molybdenum added to steel aids greatly in resisting corrosion.

In 1919 only 376 short tons of the metal were produced in the world. In 1938 production was more than 14,000 tons. Molybdenum is one of the few "precious metals"

(Continued to page 116A)

*2208*  
*precious metals*  
*Aluminum*  
*Brass*  
*Steel*  
*Iron*  
*Cast iron*  
*Stainless steel*  
*Aluminum*  
*Brass*  
*Steel*  
*Iron*  
*Cast iron*  
*Stainless steel*



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*Velvet packs easy in a pipe  
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Better tobacco for both*

PIPE AND CIGARETTE  
TOBACCO  
LIGGETT & MYERS TOBACCO CO.



(Continued from page 114A)

of which the United States has an ample supply. In 1937 this country produced ninety-two per cent of all mined, and seventy-one per cent of the world production came from a single mine at Climax, Colo., which now mines and mills 12,000 tons of ore a day. This mine has more than 100,000,000 tons of ore blocked out, with unknown further reserves.

Tungsten's earliest uses were for dyes, pigments and tanning leather. Later it was used for electric-light and radio-tube filaments. These uses continue, but the bulk of all tungsten mined now goes into steel. It makes a tough steel suitable for battleship plates and similar purposes. Steel alloys containing ten to fourteen per cent tungsten make metal-cutting tools that retain their edge at red heat. Compounds of tungsten and carbon under the trade names Firthite and Carboloy are only a trifle less hard than diamond, the hardest natural substance known. A mixture of tungsten, chromium and cobalt is sold under the trade name Stellite. This alloy, like Firthite and Carboloy, is used to replace black diamonds for core-drilling operations in prospecting for ores, and in-

vestigation of dam sites, bridge foundations, etc. Tungsten deposits, mostly small, are scattered over the western states. China has the largest known deposits.

Like tungsten and molybdenum, vanadium formerly was extremely limited in uses. Then it was discovered that a little vanadium made steel very elastic, increasing greatly its tensile strength. Now we find vanadium used in automobile and railroad springs. Twenty years ago broken automobile springs were of common occurrence. Today, unless the car is wrecked, one seldom hears of one breaking. Vanadium also is used in high-speed tool steels, pinions, axles, and other places where great tensile strength is required.

Peru long has been the chief producer of vanadium. Now, due to increased development in the carnotite fields of Colorado and Utah, there is reason to believe the United States can meet its own requirements. Carnotite is a mixture of vanadium, uranium and radium. From 1912 to 1921 it was mined chiefly for its radium content; now it will be mined for the vanadium, with the other metals as by-products.

## Winning the War on Traffic Accidents

(Continued from page 571)

selves were in many cases reversible and the geometry of the steering connections so bad that "wheel fight" was terrific. Today, large steering wheels are made so that they will bend, not break, with comfortable gripping sections and structures that absorb vibrations. Correct geometry, reductions in steering ratio of eighteen or twenty to one with high-efficiency steering gears makes steering well-nigh effortless. Self-righting gives the car "steering sense." Mechanical failures are comparatively unknown.

Riding comfort has a bearing on safety. Softer springs, independent wheel suspension, stabilators, larger tie sections, better shock absorbers, better weight distribution, and a steadily growing knowledge of the engineering factors involved have made riding comfort progress very rapidly.

Noise and vibration were both serious problems in early cars. High-frequency vibrations and droning noises have a distinct numbing and fatiguing effect on the

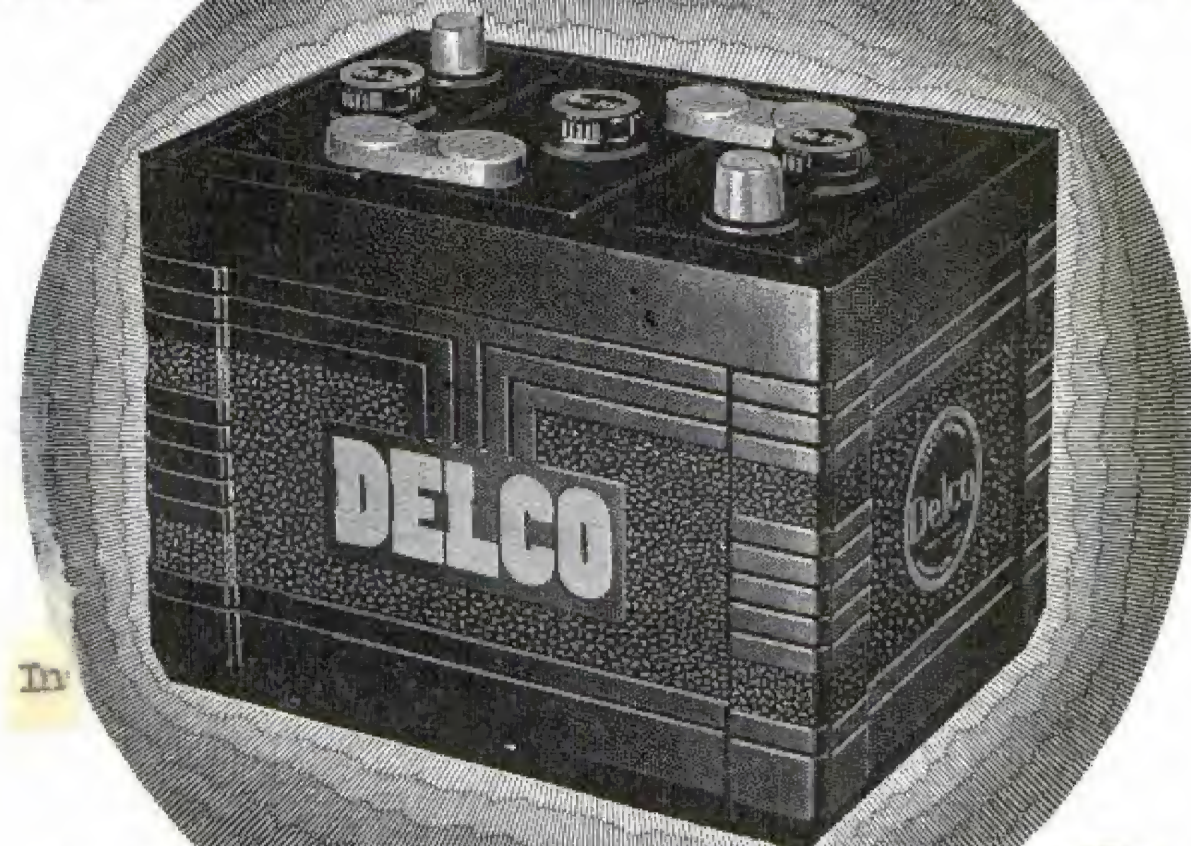
human nervous system. The last two years have seen great progress in subduing both noise and vibration.

In 1906, brakes can only be described as "awful." Today a car with four-wheel brakes in good condition can stop in thirty-five feet from thirty miles an hour, in forty-one feet if in fair condition, and in sixty feet if in poor condition. It has better brake drums and linings, greater area of braking surface, protection of the brake shoe and drum surface from dirt and water, dependable brake hook-ups, more scientific distribution of braking effort among the four wheels, lighter pedal pressures and the use of power auxiliaries in conjunction with human effort. Highly developed air and vacuum brake systems for trucks and trailers closely follow railway equipment design.

So it's plain that our engineers have gone to great lengths to make the mechanics of the automobile safer, to win the battle to reduce accidents and to save lives.



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# "PRESTONE" ANTI-FREEZE

TRADE-MARK



# Which Is the King of Beasts?

(Continued from page 565)

tured manner might suggest—and I know because I served as keeper and trainer to one early in my career. Though his shape resembles a barrel, the hippo can throw his 8,000 pounds of weight around with surprising agility. In the water he's at his best and has been known to upset a native boat with the flip of his head.

In parts of India, I'm told, natives fear the sloth bear as much as they do man-eating tigers. Though small in stature, he's savage by nature and virtually untamable. The same is true of other bears. There are a half dozen animal men of my acquaintance who rate the polar bear as the most dangerous beast of all. A Himalayan bear ruled the roost in one of my earlier acts that included hyenas, polar bears, Russian bears, lions, tigers, a black leopard, and two pumas.

What we've found to be the case in the big cage may not be true of the veldt. There's a great difference between animals living in a six-by-ten-foot cage and one exercising and fighting for his supper in the forest. For all I know, the tiger might be able to uncork a few surprises he cannot use within the confines of the arena bars.

One day in my act, as he was making his way to the top pedestal, Rogue, a Bengal tiger, was caught unawares by Prince, an ugly-dispositioned lion, and dragged to the ground. Almost before the sawdust of the ring started flying, another lion joined in the melee. Rogue began retreating, a smart move under the circumstances because by edging nearer the cage bars, he minimized the chance of an attack from the rear. Desperately, the two lions strove to get their teeth in Rogue's neck but he repulsed them. Then a third lion joined forces with the other two.

Trying to break up the fight before the twenty-one other lions were drawn into it, I directed the lions' attention to me by means of a pole. Prince, rearing up like a stallion, charged, with the other two at his heels, but shots from my blank gun shocked them out of their murderous intentions and back to their pedestals the animals trotted, seemingly relieved the battle was over after the stubborn resistance put up by Rogue.

Once at Collinsville, Pa., twenty-one of my lions staged a knock-down-and-drag-out with nine tigers. The blow-off happened when Snip, a tigress, jumped the signal to start for the door leading from the arena through the wooden chute to the cage wagons. I cued her to remount her pedestal but she refused, taking refuge behind some of the metal pedestal frames. A lioness jumped on her back and then Duke, a lion, seized the first tiger he could reach.

All the other tigers except the three top mounters jumped down to the floor of the ring, not so much to fight as to get out of the ring. Arising as one man, the lions swooped down on them. Even though the whole place was in an uproar, I could not help but watch Chester, a tiger. Fighting, kicking, clawing, he was standing off seven or eight lions all by himself! All the while, the three tigers in the "grandstand" remained perfectly calm. It just wasn't their night to fight!

I was getting ready to leave the bedlam when Chester started for me. Fortunately, two lions waylaid him so I made a fresh start for the door leading to the safety chamber. The goal was but a few steps away when a tiger, retiring from the war, sat down beside the safety cage door. Then a lioness quit the fray and took a seat on the other side. Stymied. Breaking loose from the cats around him, Chester was on my trail again so I streaked through the space that separated the two self-appointed sentries. A torn shirt and a scratched arm were my only mementos of the riot that eventually was quelled by pumping ammonia into the arena. When the smoke cleared, one tiger was dead, a second so badly wounded that he died.

Chester, who had been in the thick of the fight every second, came through with only a few minor superficial cuts.

For a brief few minutes, a king of beasts with stripes.

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H1544:

## Shooting the Sun

(Continued from page 559)

detail. With too short an exposure, the shadows appear excessively black and the desired atmospheric effect is lost.

When you are picturing a sunburst, however, with beams breaking through a rift in the clouds, the subject has little contrast. The darkest parts of the clouds are only a few tones darker than the sunbeams. Overexposure will tend to flatten out what little contrast there is. Therefore, exposure should be as short as possible; with film of average speed,  $\frac{1}{50}$  second at f.16 will suffice.

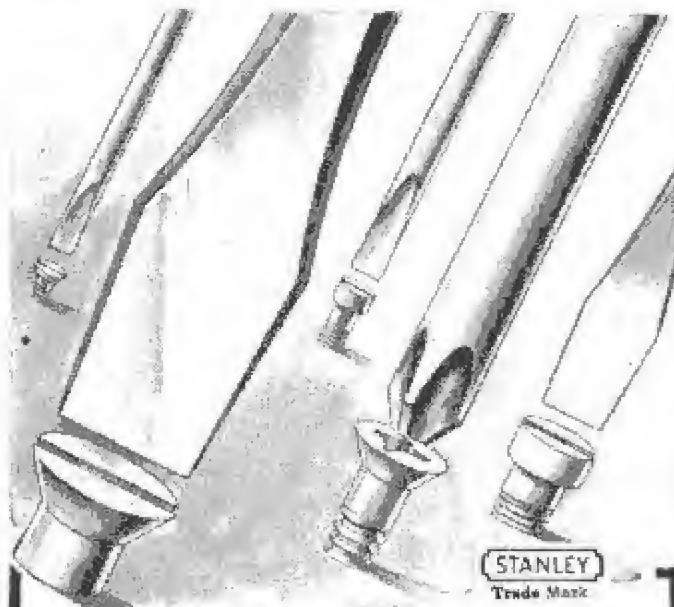
In a sunbeam picture you wish to reproduce the beams as brilliantly as possible while keeping other objects subdued. Suppose you are taking a sunbeam picture in deep woods, with a great deal of green foliage about. "Chrome" or "pan" film, being sensitive to green, might allow too much detail in the foliage, so give relatively shorter exposures or use a "regular" film less sensitive to green and yellows.

If you were picturing a distant sunburst, the chrome or pan film would be preferable; and you might use a yellow filter, the K-1 or K-2, particularly if the cloud shadows appeared at all bluish. If blue sky appears behind the sunburst, always use a yellow filter, the K-2 or G, to darken the sky and make the sun shafts stand out more brilliantly. And if you do your own developing, it is wise to develop "sunburst" negatives longer than usual, to build up stronger contrast.

"Smoke" pictures are sometimes improved by "backlighting." Light shining through smoke makes it much more brilliant—sometimes it actually seems to glow. Flash bulbs provide excellent illumination for smoke pictures, since the flash can "freeze" a slowly moving smoke curl.

Suggestions for smoke pictures might include a man blowing smoke rings . . . a table-top of toy firemen fighting a dollhouse blaze . . . a tall, graceful curve of smoke rippling up from a cigarette in an ashtray. Ideas will come in droves once you start playing with light effects.

Just keep your eyes open for sunbeams and sunbursts, dust and mist, smoke and steam—watch your exposure time—and you'll have an album full of sunshine in less time than it takes to tell.



## A STANLEY DRIVER FOR EVERY JOB

From the delicate adjusting job to the heavy, stubborn bolt, there's a Stanley Screw Driver that does the job "just right." All have cross ground tips to properly fit screw slots. Typical of Stanley Screw Drivers are the three Drivers shown below.



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Stanley Tool Catalog No. 34 shows them all.  
Write for a copy.

# STANLEY TOOLS

Division of The Stanley Works, 103 Elm St., New Britain, Conn.



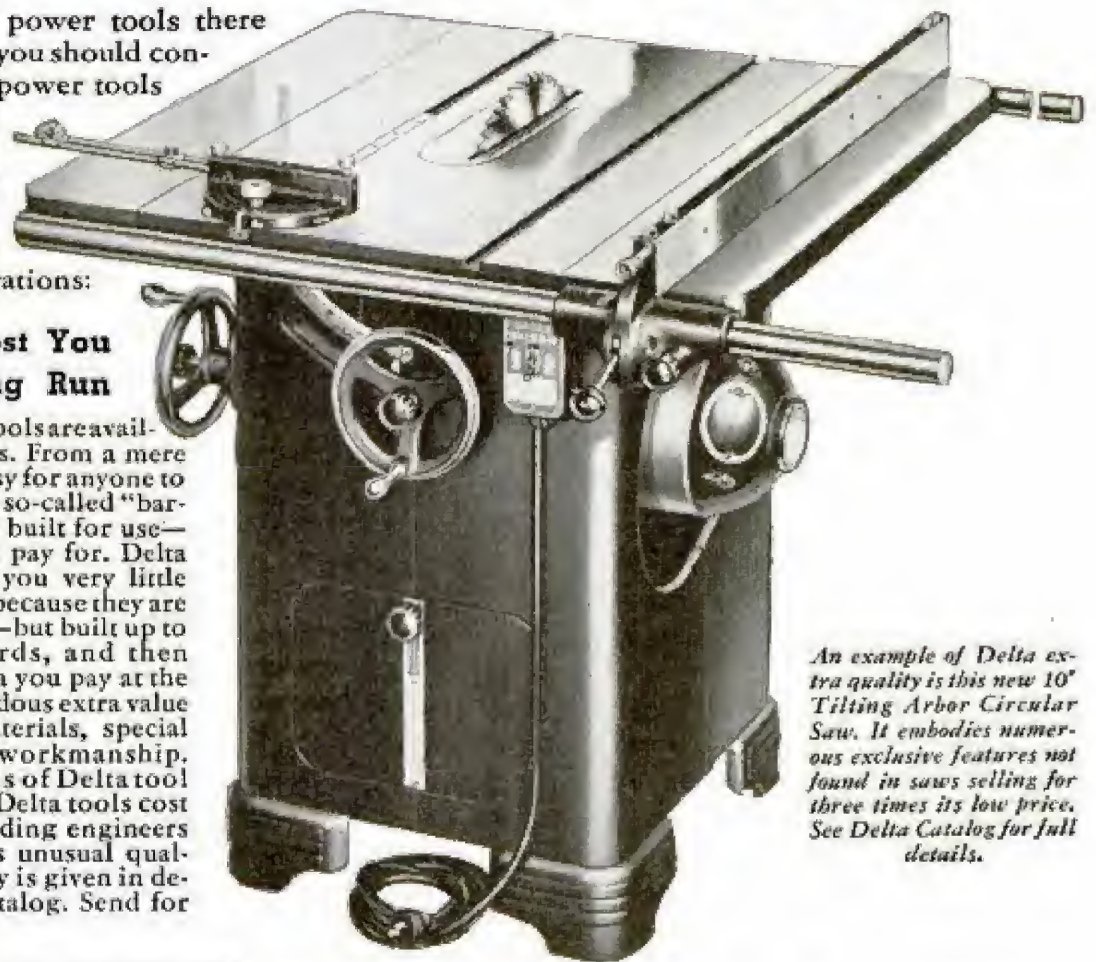
# Important Facts about POWER TOOLS

Before you buy ANY power tools there are important facts that you should consider. When you select power tools for your shop, you are purchasing equipment for many years of use, not for today alone. In making your decision here are some vital considerations:

## Quality Tools Cost You Least in the Long Run

Today, low-cost power tools are available at several price levels. From a mere price point of view it is easy for anyone to purchase "cheap tools" at so-called "bargain prices." But in tools built for use—you get exactly what you pay for. Delta tools, for instance, cost you very little more than ordinary tools because they are not built down to a price—but built up to unusual quality standards, and then priced. But that little extra you pay at the outset represents a tremendous extra value in design, quality of materials, special features, accuracy, and workmanship.

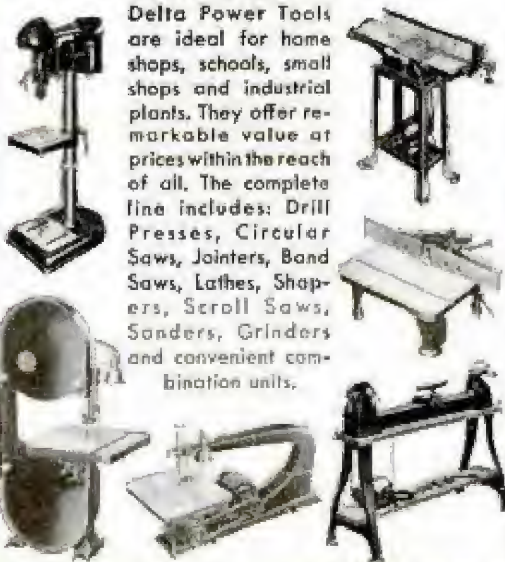
Hundreds of thousands of Delta tool owners have learned that Delta tools cost least in the long run. Leading engineers have marvelled at Delta's unusual quality. The full technical story is given in detail in the latest Delta Catalog. Send for your copy today!



*An example of Delta extra quality is this new 10" Tilting Arbor Circular Saw. It embodies numerous exclusive features not found in saws selling for three times its low price. See Delta Catalog for full details.*

## The Complete 1940 Line of DELTA QUALITY TOOLS

The new 1940 line of Delta Power Tools are ideal for home shops, schools, small shops and industrial plants. They offer remarkable value at prices within the reach of all. The complete line includes: Drill Presses, Circular Saws, Jointers, Band Saws, Lathes, Shapers, Scroll Saws, Sanders, Grinders and convenient combination units.



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The latest Delta Catalog gives you full information on the complete Delta line of low cost tools for home shops, small shops and industry. (Also send for new Project Book No. 6 crowded with new and "out of the ordinary" things to make. Send 10c with coupon for Delta Project Book No. 6 and latest Delta Catalog.)



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600-634 E. Vienna Ave., Milwaukee, Wis.

Send me the latest new 1940 Delta Catalog and list of Delta Dealers nearest me. ☐ I enclose 10c (stamps or coin) for which please send me the new Delta Project Book No. 6.

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# DELTA MFG. CO.

600-634 E. Vienna Ave.  
MILWAUKEE, WISC.



# Wonders of Ship Surgery

(Continued from page 533)

ed to routes serving South America were reconditioned for their new service at a cost of \$1,000,000, the changes including a beach deck, air conditioning, and sliding roofs over the theater and dining rooms.

A few years ago four old Hamburg-American ships were modernized by cutting off their bows and attaching longer and more efficient bows to them. Each new bow, twenty-eight feet longer than the old one, was built as a unit. The old bow was torn off the ship in dry dock and the new one welded on. Modernized, each ship was longer and heavier than it had been but the change increased its efficiency so much that much less power was necessary for maintaining its normal speed.

Getting a ship that has been badly wrecked at sea to the marine hospital is often a heroic job. If the salvage men find it impossible to save a vessel that has foundered on the rocks they may be able to cut the undamaged portion away, make it seaworthy with a temporary bulkhead, pump it out, and tow it to dry dock. If the stern half of a ship can be retrieved that way a new bow and forward sections can be built up and attached to it.

Every shipwreck is different and a wreck that may appear to be a total loss to an untrained observer is sometimes easily refloated and repaired. Others that go aground in bad weather may have to be abandoned, even though they may not appear badly damaged. Ships are rusting on the rocks of every coast although often such wrecks are torn apart piecemeal in good weather for the value of their metal. When one tanker went ashore on the west coast two attempts to salvage her failed but finally in a period of quiet weather temporary patches were made to the hull and the ship's cargo tanks were pumped full of compressed air. That gave her buoyancy

and permitted the salvage crew to drag her back to deep water and tow her to dry dock 300 miles away.

One of the most miraculous operations that ship surgeons ever performed was completed last year when the giant "Asama Maru," a \$7,000,000 passenger liner, was refloated at Hong Kong after having been driven ashore in the typhoon of 1937. A wind of 167 miles per hour tore the ship loose from its moorings and with the aid of an abnormally high tide beached the vessel almost ninety feet from the channel. The "Asama Maru" was drawing twenty-three and one-half feet of water when blown ashore and the salvors knew that there would be a tide of almost sixteen feet the following spring. Somehow they would have to make up the seven-foot difference. First step was to cut a hole in the ship's side, tear down two of the four main engines, and pass the parts piece by piece through the hole. Anchors, cables, davits, and machinery to the extent of 1,000 tons were removed and 2,200 tons of oil and fresh water were pumped from her tanks. Ten buoyancy tanks having a total lift value of 500 tons were secured to the hull.

The ship was still 2,500 tons too heavy to be floated by the spring tide so the salvage men next blasted and dug four feet of rock from under her, tipping the vessel from side to side by means of its ballast tanks to facilitate the work. Two and a half tons of dynamite were used without injuring the vessel and nearly 8,000 tons of rock were removed. The 548-foot ship floated off without a hitch at the hour of high tide, underwent temporary repairs at Hong Kong, and then sailed to Nagasaki on her two remaining engines for complete overhaul and replacement of damaged bottom plates. Today she is back in service on the transpacific run.

## "Third Dimension" Sound Effect Obtained from Two Radio Sets

Before you turn in your old radio set, try the "third dimension" trick one Florida fan worked. First decide for yourself whether the old set amplifies best the higher or lower pitches. Then adjust your new radio to the opposite extreme. Put the two

receivers at opposite sides of the room, and sit down between them. From one side you'll hear best the high notes, from the other, the low notes. The effect is that of a third dimension in sound, as if you were in the concert hall itself:

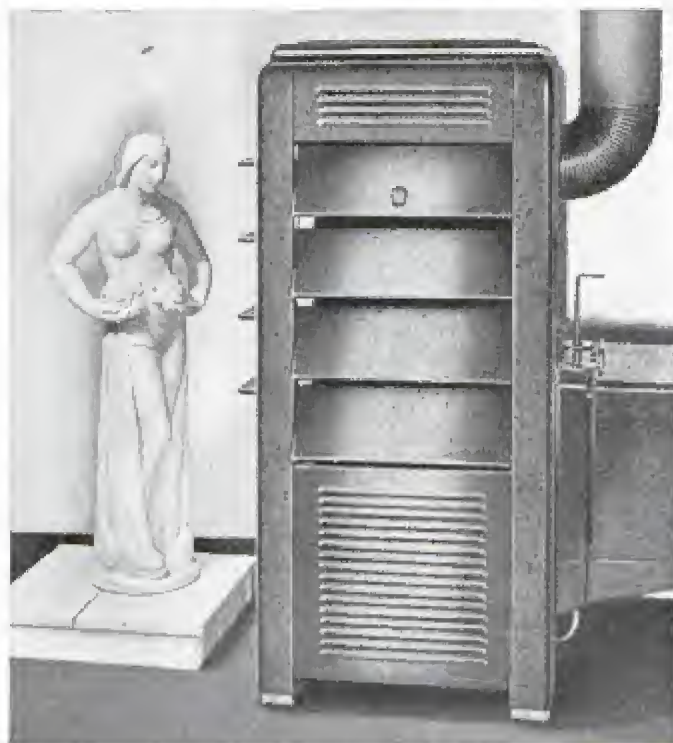
Max F. Meyer, U. of Miami

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Science Service  
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# HEAT RAYS PHOTOGRAPHED TO SHOW HEATER'S COMFORT ADVANTAGES!



*SUPERFEX photographed in ordinary light.*

SUPERFEX circulates heat; but, more important, its patented adjustable shutters direct cozy warmth outward and downward—end cold, drafty floors—without fans or blowers that increase operating expense and cause uncomfortable floor drafts. And *only* SUPERFEX has these unique patented shutters!

Dial control regulates heat volume. Operates quietly and evenly without attention. Burns wide variety of inexpensive fuel oils available everywhere. SUPERFEX brings a new sense of comfort to homes, stores, filling stations, etc. Wide choice of sizes with attached reservoirs. Many models also available with constant level valve (plus thermostatic control if desired) for use with outside fuel supply. Radiant heaters, too. Easy purchase plan. See your Dealer. Coupon brings FREE descriptive booklet.

*\*The living zone is the lower part of your rooms—where you live—the space where you especially need heat.*

## SUPERFEX

*Oil Burning*



## HEATERS

*The Mark of Quality*

PRODUCT OF PERFECTION STOVE COMPANY

*Infra-red photography shows how oil burning SUPERFEX Heater directs radiant heat rays outward and downward. No fans or blowers needed.*

To show how this SUPERFEX Heater gives more comfort, engineers turned to infra-red photography. SUPERFEX directs radiant heat, which is made up of infra-red rays that are invisible to the naked eye, but are active on certain kinds of photo film. Here at left, is SUPERFEX in ordinary light. Magic! Below—here's the same SUPERFEX as at left, photographed in the dark on infra-red film. See how the directed, radiant heat rays—like heat from the sun—strike the statue. Heat rays heat anything they strike. This is how SUPERFEX brings comfort to anyone in the living zone.\*

*The same SUPERFEX photographed in the dark on infra-red film. Statue lighted by heat rays which reach entire living zone.\**



PERFECTION STOVE CO., 7194-A Platt Ave., Cleveland, O.

Please send me free SUPERFEX Heater booklets.

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# ENOUGH SAID!

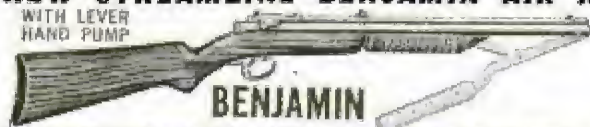
A nationally famous research organization has found that "Prestone" anti-freeze is used in more modern\* cars than all other brands combined!

\*Cars up to 5 years old

(SEE PAGES 118A and 131A)

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WITH LEVER  
HAND PUMP



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**HARD ACCURATE SHOOTING WITH CHAMBERED AIR**  
You can use new models BENJAMIN AIR RIFLE WITH LEVER HAND PUMP anywhere, for practice firing or just plinking around the house or camping, fishing, hunting, etc., at lowest cost. Shooting force is adjustable depending on AIR PRESSURE—averaging maximum power and accuracy—will penetrate to 1". Hair trigger firing without bump or recoil. Single Shot BB \$7.50, Repeater BB \$9.00, Rifled Cal. 22 or 177 Single Shot \$8.50. Ask your dealer all about them or write for complete specifications—targets and blueprints FREE if requested. We also make a complete line of BENJAMIN AIR PISTOLS for target and small game. WRITE TODAY. BENJAMIN AIR RIFLE CO., 895 MARION ST., ST. LOUIS, MO. U. S. A.



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9 PROSPECT AVE.  
HAGERSTOWN, MD.

## Touchdowns in the Making

(Continued from page 549)

ing. Bernie Bierman, head coach at Minnesota, says:

"Blocking is the essence of offensive football. Running, of course, is of prime importance and is the basis of all offensive maneuvering, but blocking paves the way down the field. And just as a team of con-



Charging sled helps to build up arms and shoulders and teaches use of the hands

fident, hustling blockers paves the way for offensive success, a team of pounding, sure tacklers is almost impossible to score against."

The tackling dummy is standard equipment for teaching correct form in blocking and tackling. In recent years, however, a number of new and improved variations of the old canvas bag that hung from a cross-arm have been devised. One of these is the blocking bag. It is usually constructed of canvas or leather and filled with sawdust or padding. On the field it simulates an opposing player. The players line up opposite the blocking bags, the ball is snapped back and the linesmen and interference must knock the heavy bags out of the way so that the ball carrier may get through.

Otto Klum, head coach at the University of Hawaii, has invented a tackling dummy that is a vast improvement over the kind in common use. A three-inch rubber rope,



fastened to a crossbar at top and to the ground below, supports a canvas-covered bag. Coaches declare that this rubber-controlled bag is more like an opposing player than anything yet devised. It may be used by one or two men at a time for charging, blocking, and tackling.

One of the latest developments is the blocking apron, huge, padded overalls worn by scrub players. Designed especially to protect the chest, stomach and legs of those players who wear it, the apron permits the use of "live bait" as tackling and blocking dummies without fear of injuring either the varsity men or the third stringers. The University of Pennsylvania has found this type of equipment helpful on the practice field.

Some coaches have discovered that automobile tires suspended from the goal posts provide good early season targets for passing backs. Later on, pass receivers in motion provide better targets. After accuracy is attained, the passer must learn to judge distance and speed of the receiver. Northwestern University uses automobile tires for passing targets. At U. C. L. A. a new variation is a single tire mounted on an upright standard.

Coach Howard Jones at the University of Southern California has rigged up a unique device to teach his centers greater accuracy in passing the ball. A huge canvas sheet, with two holes waist high, is



Wide World Photo

*Aprons absorb the shock of players practicing blocking at University of Pennsylvania*

strung between the goal posts. Two centers stand over the ball about twenty feet from the target and try to pass the pigskin through the holes.

Punters are sometimes shown how they

(Continued to page 126A)



*this* **FREE BOOK**  
HAS HELPED  
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Will you risk a penny postcard to get this new **FREE** 1940 radio catalog? It opens the door on a new world of interest, education and profit. Thumb through its 188 pages and discover the opportunities it holds out to **you!**

Here, at your fingertips, is everything in radio and modern P.A. New complete line of 1940 receivers. All nationally advertised parts, tubes and equipment. Our famous Build-It-Yourself kits that have built radio careers for hundreds.

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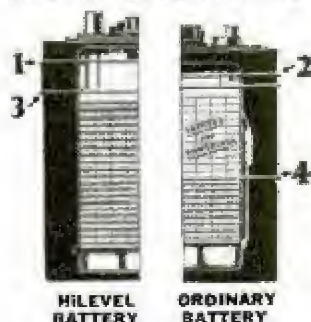
Prest-O-Lite Dealers  
Now Offer New  
51-PLATE FIBERGLAS

## SILVER JUBILEE HiLEVEL BATTERY

NEVER a battery value like this. The low price will amaze you! Yet this battery sensation is packed with 7 remarkable features to save you money, time and trouble this winter. Fiberglass insulation. 51 big powerful plates. Added water capacity. Extra power reserve. Rugged construction. Plenty of punch for winter starts. 24-month adjustment period! And because of the Prest-O-Lite HiLevel principle, this remarkable battery needs water only 3 times a year under normal usage. Before battery failure hits you, see your Prest-O-Lite dealer and get the facts about the new SILVER JUBILEE HiLevel, Prest-O-Lite's answer to your winter starting problem!

PREST-O-LITE BATTERY CO., INC., INDIANAPOLIS, INDIANA  
Manufacturing Plants at: Indianapolis, Niagara Falls, Oakland, Oklahoma City, Toronto

### HOW HiLEVEL FEATURE WORKS



- ① FILLING LEVEL of Hi-Level Battery. (Note extra height.)
- ② FILLING LEVEL of ordinary battery.
- ③ By the time the fluid in a HiLevel Battery drops to here, (note plates are still covered) . . .
- ④ . . . in an ordinary battery it falls to here, leaving a large part of the plate surface exposed and powerless.



**prest-o-lite**  
HiLEVEL BATTERY

(Continued from page 125A)

can get height into their kicks by a simple device. A rope is tied to their kicking foot and strung over a crossbar. With another player pulling on the rope, the punter can determine just how high he can force his foot.

The use of motion pictures in training a football team is becoming increasingly widespread. Each Saturday's game is photographed from start to finish, and on the following Monday coaches and players study the films to discover their mistakes. In slow motion, the camera tells a graphic story of why touchdowns are made or not made.

Most college gymnasiums have extensive outlays of the latest scientific equipment for treating gridiron injuries. Aching and bruised muscles are exposed to treatment of water baths or violet-ray lamps. When muscles are allowed to become inactive for a time because of injury, team doctors have a number of devices for exercising through the use of weight-lifting or mechanical exercisers. One physician makes football players with "Charley horses" and other leg ailments pedal around on a bicycle while convalescing.

### The Band Comes Marching Back

(Continued from page 517)

C. G. Conn, Ltd., have introduced hydraulic expansion into instrument building.

To see the way in which this \$500,000 bit of research works, let's watch the making of a French horn. Its bell—that's the flaring mouth of a horn—and some of the other parts require bending to get the proper curvature before assembly. So, with the completion of the preliminary steps in which the bell is fashioned from a sheet of brass, it is filled with molten pitch. Cooling to the proper consistency, the straight bell is placed in a special block form, of the shape required, and bent. Though the pitch cuts down on their number, small wrinkles and rough spots form, just as they do when a person crooks his finger.

Formerly, these were pounded or rubbed out. By pulling the bell or some other part through rings and working on them with shaping irons, the outside surfaces could be smoothed but those on the inside would remain. In fact, they'd become worse, for

(Continued to page 128A)



# DON'T RISK ACCIDENTAL ROLL BACK of YOUR CAR or TRUCK!

# NoRoL

## HOLDS CAR on HILL STOPS

You probably have often wished for a device that would automatically prevent unintentional back-roll when car is brought to a stop on an incline . . . Such a device is available. It is called a NoRoL. It isn't expensive . . . It is easily installed . . . Is 100% automatic in operation—and should outlast the car.

NoRoL gives you a "third foot"—doing brake duty against back-roll on inclines, while right foot is left free for accelerator duty. Eliminates fatigue and frazzled nerves when you are driving in congested traffic in hilly country or on city streets . . . Does away with chance of back-roll on uphill start which might result in breaking axle shaft . . . Prevents unnecessary wear on clutch facings . . . Also lessens chances for clashing or breaking of transmission gears.

When ordering a new car, insist that it come complete with a NoRoL figured right in with the time payments. NoRoL is available for new models of—

BUICK	DE SOTO	LA SALLE	PLYMOUTH
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CHEVROLET	GRAHAM	OLDSMOBILE	STUDEBAKER
CHRYSLER	HUDSON	PACKARD	INTERNATIONAL
WHITE and others			

Also available for many 1936, 1937, 1938 and 1939 makes and models of cars and trucks.

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### HERE'S HOW IT WORKS

When stopping on any incline, no matter how steep, you simply apply the brake and disengage the clutch in the usual manner. An automatic check retains the hydraulic pressure in the braking system which was developed when the brakes were applied. This hydraulic pressure holds the brakes applied as long as the clutch pedal is held depressed, enabling the driver to take his foot off the brake pedal and use it for accelerator duty. Thus making it unnecessary to keep his right foot on the brake pedal while the car is stopped. It's like having a third foot.

## Wagner Electric Corporation

(Manufacturers of Lockheed Hydraulic Brakes)

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## PREPARED FOR TRAVEL

Motor tuned, oil changed, tank full, tires checked—car all set for a motor trip. But how well are you equipped to find your way over strange roads?



A Hull Auto Compass will keep your directions before you at all times. Streamlined Bakelite case, genuine sapphire bearing, built-in compensator. Only \$2.95 at your dealer. Two-piece model \$1.95. Write for literature.



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A real necessity for electricians and home because it has 1001 uses. Equipped with a Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, all kinds of electric appliances, etc. Tells A. C. from D. C. Far superior to ordinary clumsy test bulb. Fountain pen size with clip for carrying in vest pocket. Lifetime guarantee.

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Lambert Pharmaceutical Co., Dept. 90, St. Louis, Mo. Please send me free and postpaid your large sample tube of ☐ Listerine Shaving Cream; ☐ Listerine Brushless Cream. (Check whichever is desired.)

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(Continued from page 126A)

the waves and wrinkles are pushed down into the inside of the tubing. Lead balls were used for a time to get them out but they weren't entirely satisfactory so hydraulic expansion was developed. When the horn is ready to have the wrinkles removed, it's placed in a tool steel die and the ends plugged shut, one being utilized as a nozzle. The tubing is then filled with cold water and the water is subjected to terrific pressure, as much as 4,000 pounds per square inch. This pressure irons out the tubing against the walls of the die, giving the part absolutely accurate dimensions and making the inside surface as smooth as glass for carrying the delicate tone waves without distortion.

The average trumpet or trombone has a seam running through the complete length of the bell stem and bell bottom; a few with two-piece bells have one through the stem and the other where the bell bottom joins the stem. A seamless bell is the latest development. By means of an electro-mechanical process the structure of the metal is built up from pure copper ions in regular conformation with the bell forming in a solid piece.

The use of plastics in the making of clarinets has been more or less limited owing to the fact that substances of this nature are too difficult to machine. After three years of experimenting with plastics that had all the qualities necessary for the accurate production of tone and pitch, Kohlert has come out with one of a transparent substance called plexi-glass. While clear as crystal, the unusual material is not brittle and can be machined, tapered, and drilled. It's virtually impervious to moisture and will not warp or crack.

A scientific, foolproof way of measuring pitch and intonation of instruments is with the chromatic stroboscope. The frequency of any sound in the scale is registered visually so it can be measured easily and quickly for correctness to  $\frac{1}{1000}$ th of a semi-tone. If a note is in tune with the tempered scale based on a 440, a pattern on the revolving disk appears to stand still. If the note is sharp, the pattern appears to revolve to the right. If the note is flat, the pattern seems to turn to the left. By adjusting a knob the pattern can be made to stand still. A dial is then read to determine how many  $\frac{1}{1000}$ ths of a semi-tone the note is sharp or flat.

## Ride 'Em Cowboy!

(Continued from Coloroto Section)

his rope at a calf, drop it in its tracks, and tie its feet with a piggin string. Three-quarters of the speed and skill in this event are contributed by the cowboy's horse, and a good roping horse may bring from \$1,500 to \$3,000 on the rare occasions when such stock is placed on the market. A good horse learns instinctively to dig its feet into the ground the instant its rider's lariat circles the neck of the roped animal. The shock of the abrupt stop throws the maverick to the ground and from that time on the horse keeps backing away to hold the rope taut and prevent the animal from rising again. A trained roping horse always balances itself against the shock of the throw, otherwise the horse and rider themselves are apt to be thrown.

Cattlemen in different parts of the country have slightly different roping habits when simply throwing a lasso to capture an animal. Men from the north are known as tie-hard ropers and they use a short thirty-foot rope, one end of which is tied securely to the saddle horn. Men from the south are called dally-ropers and they use a lariat nearly twice as long, paying it out through a couple of turns around the saddle horn to ease the pull when a heavy animal is roped. The ropes themselves are much thinner today than they were twenty years ago, due to improved materials and methods of weaving.

Cowboys don't wear their picturesque clothes for looks but because such clothes are suited for their work. High-heeled shoes prevent the feet from sliding through or catching in the stirrups and also help a dismounted cowboy to dig in against the pull of an animal when he is roping from the ground. His spurs are always blunt and are used to stir up his horse when a burst of speed is necessary in capturing strays. The jeans that he wears are narrow-legged so that they will fit snugly inside the heavy leather chaps that protect his legs from brush and thorns. He often carries a revolver, even today, and uses it on the range to kill injured animals and to shoot rattlesnakes. His wide-brimmed hat is the best protection against the sun and the rain and his neckerchief may be wound around his face to protect his nose and mouth from clouds of dust at the drag end of a herd. The neckerchief is also a protection against frostbite in cold weather.



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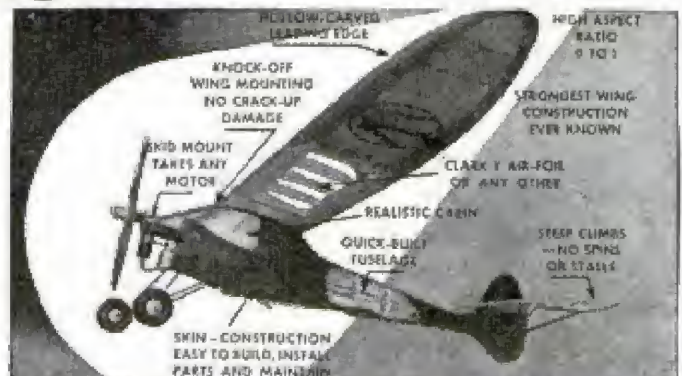


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8697

# Diesel Limited

(Continued from page 555)

open again by the time the rear of the train has cleared the curve.

Just like an air liner, the streamliner is affected by weather conditions. Headwinds slow down its speed and tail winds help boost it along. The worst wind of all is a quartering headwind that blows back against the entire length of the train.

One way the streamliner saves time is by rarely stopping. A stop of one minute adds five minutes to the running time of a train because of the delay in slowing down and getting up to speed again. The stops that an ordinary train makes on a trans-continental trip may total several hours. The average stop of the Diesel is for only two minutes, just long enough to change crews and make routine inspection of wheels and brakes. There is always a clear track ahead, for other fast trains are side-tracked until the streamliner rockets past. A Diesel stops for fuel twice and for water one other time on its long run, while between the same terminals a steam locomotive would need to refuel five times and replenish its water every 200 miles.

Enginemen on the streamliner literally turn it loose across the long level stretches of the middle west to make up for the slow climbs across parts of Arizona and New Mexico where four 7,000-foot summits are crossed. On two of the steepest grades a helper engine is attached to the train to boost it along faster than it could climb by itself.

In those parts of the west you aren't apt to see many wild animals from an automobile because the noise of your approach scares them away. The streamliner moves so much faster that the engine crew gets good looks at herds of antelope and deer, occasional coyotes, and numerous small animals before they slip away into the brush. Sometimes at night a deer standing on the tracks is confused by the glare of the headlight but it bounds away when the engineman sounds a warning whistle.

Sitting at the controls of a record-breaking train carries heavy responsibilities. The engineman's job is to deliver his train on time but he is first concerned with the safety of his passengers. The queer part of it is that the faster he goes the safer he feels. He sits relaxed in his seat at ninety

and 100 miles per hour and tenses up ready for instant action at thirty miles per hour. That's because top speeds are made in open country and the slow speed limits are observed in congested areas where he has to be prepared for a fast stop any second. He rides with one hand on the air-brake lever and in districts that have numerous grade crossings he uses two pairs of eyes instead of one to watch the road.

When the engineman moved from the steam locomotive to the streamliner he took his fireman with him even though there are no fires to feed on the Diesel. The wide-awake engineman misses nothing in front of him but simply for safety's sake the fireman rides beside him, calling the track signals aloud with the engineman repeating them after him. In congested districts the fireman calls out the cars he sees approaching grade crossings.

Semaphores along the right of way are electrically operated and if something happens to a circuit the semaphore automatically moves to the stop position. A blank board, with no lights visible is the same as a "red board" to the engineman and he stops the train, then moves along slowly until he reaches a clear signal.

Now that the streamliners have been on the rails for several years and have proved that they can maintain fast schedules, plans are being made for more improvements. In one early demonstration the "Super Chief" ran from Los Angeles to Chicago in thirty-six hours and forty-nine minutes, three hours under its regular schedule. One idea research men are tinkering with is a hydraulic drive. Hydraulic transmission might be smoother still and probably would require a minimum of maintenance. The streamline trains have tight-lock coupling between the coaches that allows the whole train to move off as a unit from a standing start without taking up slack between the coaches.

The coming of the streamliner has helped increase the speed of all trains because many of the sharpest curves have been modified to allow the streamliners to drive at full speed. Each curve reduction means that steam engines can also move faster than in the past. Track condition is the real speed limit in fast railroading.



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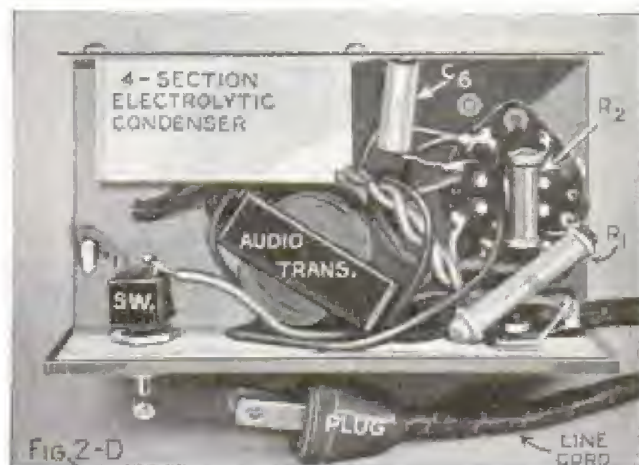
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## Beginner's One-Tube A.C.-D.C.

(Continued from page 617)

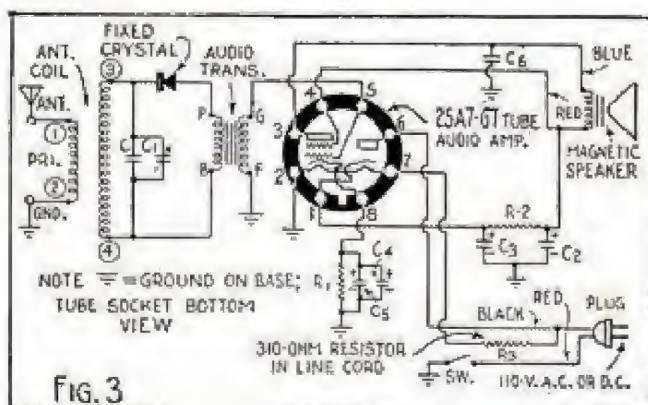
midget-type antenna coil in order to obtain the advantage of more turns on the primary winding.

Those who wish to experiment can try a Litz-wound r.f. coil in the antenna coil position, if desired. However, the ordinary coil employed in the model gave good re-



sults. A list of the materials used in the original model is available to beginners and can be obtained from Popular Mechanics radio department without charge. All circuit connections indicated as grounded on the metal base must be soldered carefully with rosin-core solder.

The set tunes broadly and the station will be received over quite a wide range of



adjustment; no volume control is required. If necessary to reduce volume it may be done by detuning slightly. Like any other crystal detector, this one requires a good long, and high, outdoor antenna, and a ground connection to a cold-water pipe if possible. Tone quality is improved considerably when the set is installed in a small homemade wood cabinet. The blueprint number for this article is R-271.



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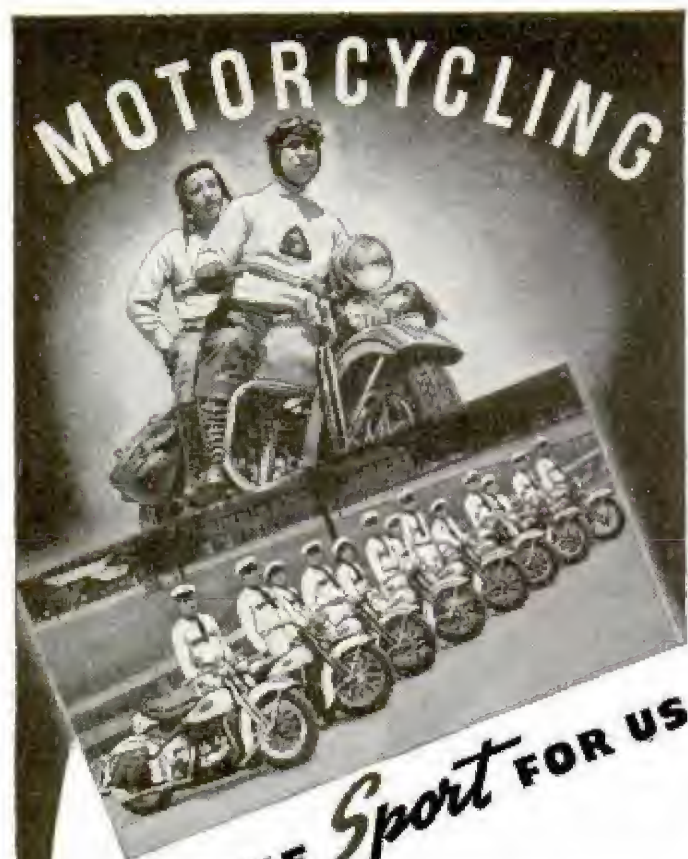


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## Forty Fathoms Down

(Continued from page 485)

The winch operators swing Sibitzky back to the deck. "Skee" has been under no pressure and will not need decompression to reduce gradually the nitrogen gas that is built up in the blood stream after a diver gets below one atmospheric depth, or thirty-three feet.

But Badders must be decompressed with exact schedule, if the dreaded "bends" are to be avoided. His voice comes out of the loud speaker again, distorted by compressed air from its normal baritone to a pitch close to soprano.

"I'm near the descending line, now," Badders reports. "I can see it . . . two stanchions to go . . . one stanchion . . . standing by to come up."

"Okay," replies Momsen, "the stage will meet you at ninety feet."

Now Badders is aboard the diving stage, waiting for the timer to say when he will move to the next decompression stop.

"I got a little groggy down there," Badders telephones up to Momsen. "I tried to move across the deck and I came up short. I thought there wasn't enough slack in my lines. Then I forget what happened. The CO<sub>2</sub> was building up pretty bad, I guess. Anyway, I snapped out of it enough to shove my jaw against the button and vent my 'hat.' I'm okay now."

Every man on the "Falcon's" deck can visualize what happened . . . carbon dioxide in the helmet . . . dizziness . . . semi-coma . . . then a frenzied shove of the jaw against the vent button inside the helmet, used to increase the amount of air exhaust when the diver's hands are occupied or he faces an emergency.

A sailor with a stop watch calls: "Time."

"We're bringing you up to eighty feet," Momsen telephones, "You had two minutes decompression at ninety feet; you'll get two minutes at eighty, three at seventy, five at sixty and ten at fifty."

"How long was I on the bottom?" asks Badders.

Momsen tells him seventeen minutes.

"It seemed like a year," returns Badders. "Say, you know when I snapped out of it I traced my lines back and found they were fouled. I guess I better go back to diving school."

The fantail laughs. Badders holds the



Navy Cross for risking his life "beyond the normal call of duty" when one of the pontoons got out of control on the "S-51" job in 1925. Badders and MacDonald share honors for the world's deepest dive, 500 feet in a tank, using helium-oxygen. Badders went down with diver John Mihalowski in that historic fifth trip of the rescue chamber to the after deck of the "Squalus," risking life and all hope of rescue for themselves on the difference of a few ounces between the pressure equalization chamber and the after torpedo compartment. Rear Admiral Cyrus W. Cole, commandant of the Portsmouth navy yard and commanding officer of the "Squalus" salvage unit, called this final chamber trip, which revealed all twenty-six men were dead, "the most dangerous task undertaken by the divers, for if they had become incapacitated there was no way in which they could be rescued as the chamber could not be entered from the outside."

Badders go back to diving school! No wonder the fantail laughs.

"Time," reports the tender with the stop watch.

"Coming up," warns Momsen at the batteryless telephone.

"Okay," says the voice under the sea.

The winches groan as the cable of the diving platform rolls about the drum.

The hands of the stop watch fly around. Badders has had sufficient underwater decompression and now the nitrogen has been reduced enough to allow him to be surfaced. Out of the water he rises on the platform, chortling weird sputterings from the exhaust of his helmet, swaying under the burden of 200 pounds of lead.

As soon as the platform touches the deck, tenders leap to his side, carefully clear the helmet from his shoulders and pull off the leaden belt. Every move is made rapidly, for Badders must get under pressure again as definite insurance against the bends. His face is flushed and he is dog tired, but there is no outward sign of the stream of nitrogen gas that still surges in his system. If he doesn't get under pressure in, say, five minutes, the naval medical corps may have on its hands a patient screaming with agony.

MacDonald leads the diver to the "Falcon's" huge recompression tank amidships. Badders' clumsy diving dress throws a

(Continued to page 137A)

# Do you want ALL-WINTER RADIATOR PROTECTION FOR ONLY \$1.50?

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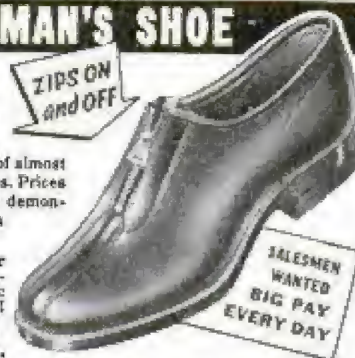
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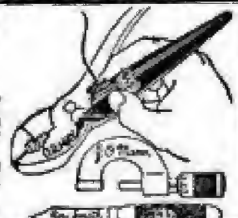
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Alkalize with  
**Alka-Seltzer**



(Continued from page 135A)

trail of salt spray over the deck as he shambles wearily toward the "iron doctor." The tenders help Badders into the chamber, dog down the door behind him, and start pulling off the breastplate and the one-piece diving dress. Already, the pressure inside the recompression chamber has been stepped up to the same amount that Badders felt at his final decompression stop underwater—the twenty-two pounds of the fifty-foot level.

An oxygen mask goes over Badders' face. For one hour, in the warmth and comfort of the chamber, he will breathe oxygen and undergo twenty-two pounds of pressure. The navy has discovered that by surfacing a diver at fifty feet and recompressing him under oxygen at the same pressure it can reduce the total decompression time, insure the health of the diver and clear the water for another descent.

Lieut. A. R. Behnke of the navy medical corps, authority on submarine medicine and diving, sits in the chamber with Badders to make sure he suffers no ill effects. Stimulated by a bowl of warm soup, Badders stretches out on a cot, relaxing. In an hour, oxygen will remove seventy-five per cent of the rampant nitrogen. The diver will be able to assimilate the remaining twenty-five per cent in the normal surface pressure of fourteen and seven-tenths pounds a square inch.

Outside on the starboard deck, Lieut. F. W. Laing, prospective skipper of the "Falcon's" sister diving ship, "Mallard," peers through a porthole. He speaks to Badders over a telephone hook-up.

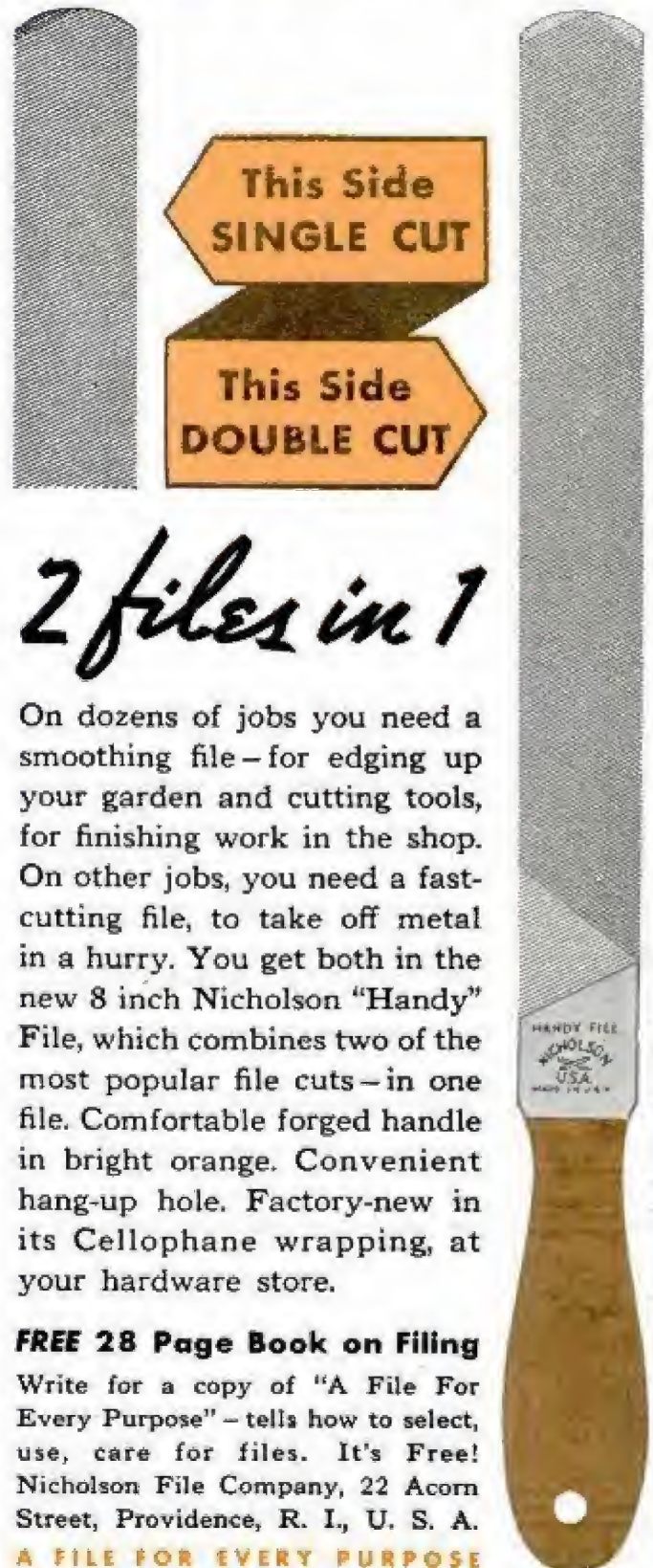
"Swell job you did in pulling out of that jam down there," he says. "That's the trouble with compressed air; it makes you so drowsy."

"Yeah," replies Badders, now speaking in normal voice through the open mouth of his mask. "I like the helium dives better. They leave your head clear, even if your voice does sound like Donald Duck. No more compressed air for me as soon as the boys can get to mixing and settling helium and oxygen fast enough to catch up with the demand here."

Aft on the fantail, another diver prepares to go over the side. The most complicated and dangerous submarine salvage job in history continues its routine—with sudden death lurking behind every dive.

(To be concluded next month)

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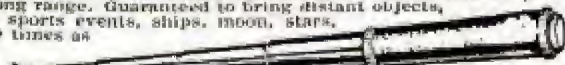
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## ITCH STOPPED in a Jiffy -or Money Back

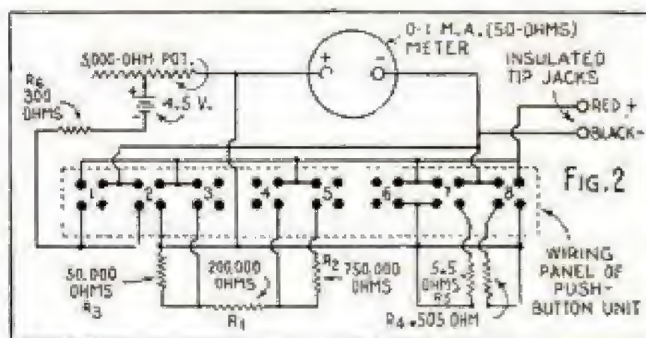
For quick relief from itching of eczema, pimples, athlete's foot, scales, scabies, rashes and other externally caused skin troubles, use world-famous, cooling, antiseptic, liquid D. D. D. Prescription. Greaseless, stainless. Soothes irritation and quickly stops the most intense itching. 35c trial bottle proves it, or money back. Ask your druggist today for D. D. D. PRESCRIPTION.

## Push-Button Set Tester

(Continued from page 618)

Simplified wiring diagram Fig. 1 shows all connections clearly, and the schematic circuit diagram appears in Fig. 2. All resistor values are given in these diagrams; shunt resistor  $R_1$  is for 100 m.a. measurements, and  $R_5$  for 10 m.a. readings.

Photos A, B and C offer various views of the completed unit. Looking at the unit in operating position as shown in photo B, it will be noted that the first button at the right is No. 1. This button is for the high-ohm scale for testing resistors from 100 to 100,000 ohms; also for shorts and continuity checking. Button No. 2 is for the low-ohm scale for resistance from zero to 500 ohms; this may be used also for testing tube filaments, r.f. coil windings and



speaker voice-coil resistance. No. 3 is the voltage scale up to 50 volts d.c. Sensitivity of all voltage measurements is 1,000 ohms per volt. This is useful for bias measurements, drop across resistors and chokes, and for testing B-batteries. Button No. 4 is for voltage up to 250 volts; a very handy scale for point-to-point voltage test in a.c. or combination a.c.-d.c. receivers. By placing the negative "black" prod at ground potential (chassis), the positive "red" prod can be used to indicate relative potential at all other points. Button No. 5 provides voltage tests up to 1,000 volts.

D.C. current measurements up to 1 milliampere maximum are available by means of button No. 6. As this is very small current, care should be taken when using this scale; it may be employed to measure diode detector current, or current in photocells. No. 7 measures up to 10 m.a. and button No. 8 is for current measurements up to 100 m.a. With the exception of No. 2, any push-button may be depressed for any length of time. As current is taken when No. 2 is down, this scale should be used only when required.



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4

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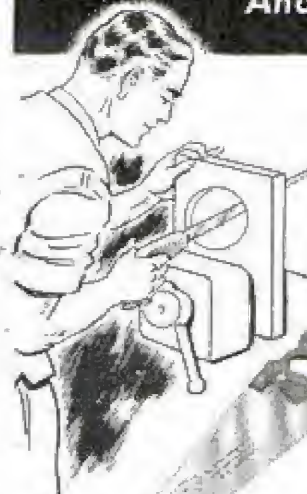
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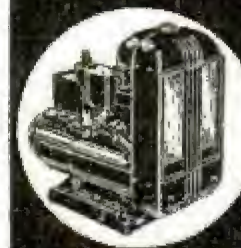
# RECORD!

Last winter alone "Prestone"  
Brand anti-freeze saw mo-  
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(SEE PAGES 118A and 131A)

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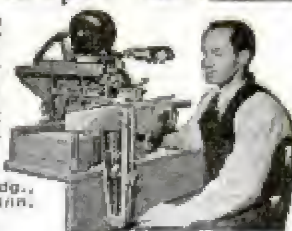
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Send Free Plan on Saw Filing business.

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## New Weapons to Fight Disease

(Continued from page 523)

range received by the body helps develop the compounds known as vitamins A, C, and D that are useful in preventing or curing bone rickets, preventing colds and some bacterial infections, clearing up skin afflictions, and in preventing scurvy.

The lethal action of the shortest ultra-violet rays on bacteria and molds recently gave the research workers at Westinghouse an idea which resulted in develop-



New X-ray tube that enables science to take "candid" photos of human structure

ment of a lamp which sterilizes the air within its range and reduces the chances of infection.

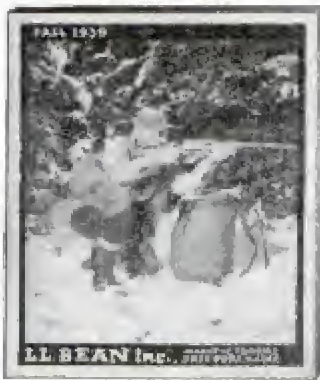
Today the "Sterilamp" is used in restaurants to sterilize cooking and eating utensils, in banks and other places to reduce the chance of transmitting colds, in bakeries for inhibiting the growth of molds on fresh products, and in meat refrigerators for keeping the meats in better condition. Manufacturers of food products sterilize the entire atmosphere inside their buildings by placing these lamps at the inlets of their air-conditioning systems.

From the medical standpoint the new death-dealing lamps are a boon because

(Continued to page 142A)

England - Sterilamps  
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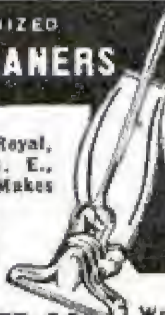
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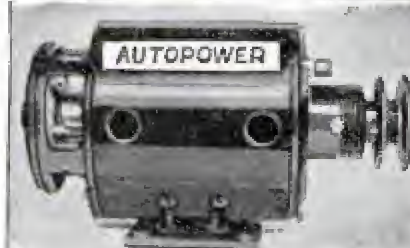
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*Posed by professional models*



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25 LBS. QUICK  
THIS SIMPLE WAY**



ARE you afraid you can never be a naturally attractive in a bathing suit? Well, thousands of men who once were skinny, tired, nervous—almost ashamed to be seen on the beach—have easily put on just the pounds they needed, gained normal health, pep and the natural good looks and popularity these bring—with these scientifically prepared, easy-to-take little Ironized Yeast tablets.

### Science gives the answer

You see, scientists have discovered that many people are thin, run-down, tired, jittery—unable to eat and sleep properly—simply because they don't get sufficient Vitamin B and iron from their daily food. Without enough of these substances you may lack appetite and not get the most body-building good out of what you eat.

Now you get these exact missing substances in these marvelous little Ironized Yeast tablets. No wonder they have helped thousands who needed these substances to gain new naturally attractive pounds, new pep, popularity and success—often in just a few weeks!

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Get Ironized Yeast tablets from your druggist today. If with the first package you don't eat better and FEEL better, with much more strength and pep—if you're not convinced that Ironized Yeast will give you the new normally attractive pounds, new energy and life you've wished for, the price of this first package promptly refunded by the Ironized Yeast Co., Atlanta, Ga.

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**TUNE IN JOHN J. ANTHONY'S GOOD WILL HOUR.**  
See your local newspaper for exact time and station.

245

(Continued from page 140A)

there has always been some risk of infection from air-born bacteria during the time a patient is on the operating table. Approximately 50,000 bacteria are apt to fall on an open wound in an hour's time in spite of the most careful precautions. By sterilizing the air above the operating table, ultraviolet tubes suspended from an overhead fixture materially reduce all chances of infection. Another advancement in the operating room is the use of bactericidal paint containing four per cent chlorine. Walls and ceilings thus coated are deathtraps to bacteria that touch them.

So far cosmic rays, the least understood of all forms of energy, have not been found to have any effect on life, although a suggestion is that direct hits by cosmic rays account for mutations in plant life.

Aside from the contributions of physics to medicine, the mechanical world is constantly providing new instruments to aid the physician in his battle against disease. The "iron lung," the new microscopes, and the gastroscopes and other instruments that enable a doctor to look through or into the body are all important tools.

An entirely new horizon in chemotherapy was sighted when it was learned that sulfanilamide, a coal-tar derivative formerly regarded as a waste product, is a specific remedy against a number of kinds of illness. This lifesaving drug has accomplished wonderful results in cases of spinal meningitis, peritonitis, scarlet fever, tonsillitis, and other streptococcic infections.

Many members of the medical profession regard this discovery as the greatest medical advancement of the century. Pneumonia has been one of America's greatest killers but now this disease is being conquered by sulf-pyridine, one of the newest of the sulfanilamide derivatives. Another form of the drug has arrested tuberculosis in guinea pigs.

A hope of the medical world is that other drugs, possibly related to sulfanilamide, may be discovered that will be effective against filterable viruses. Viruses are of submicroscopic dimensions and are responsible for diseases such as the common cold, sleeping sickness, yellow fever, and infantile paralysis. Related sicknesses in animals have already been slowed down by new chemicals and doctors cautiously express the hope that some of the compounds will be effective in treating humans.

Write U. S. Emb. Health Service, Washington, D. C.



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Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store

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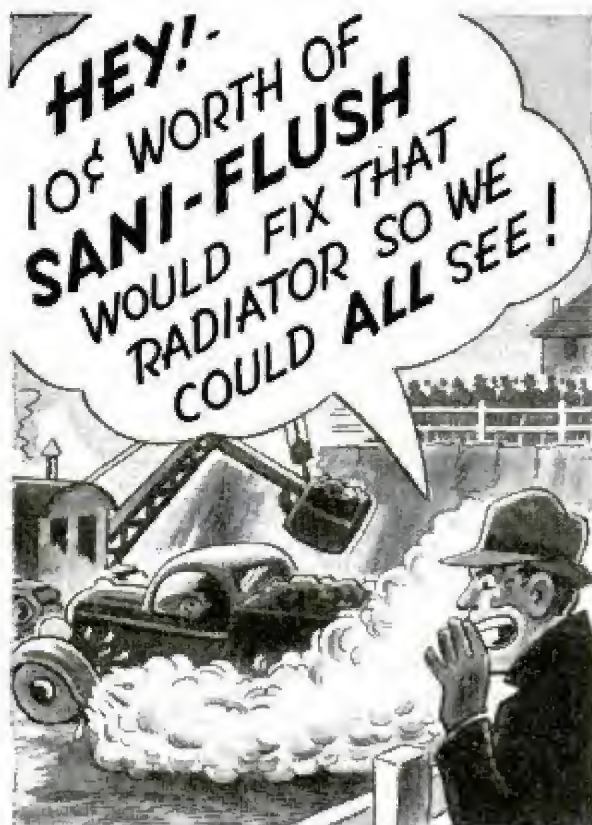
**NOW a DYNAMIC HEAVY DUTY INDUSTRIAL WELDER**

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Don't wait for your radiator to boil before you clean out the rust and scale that clog it! Use 10c worth of Sani-Flush at least twice a year (25c for the largest trucks and tractors).

Here's all you have to do: Pour in Sani-Flush. Run the engine. Drain. Flush. Refill with clean water. (*Directions on the can.*) Sludge and sediment are flushed away. The motor runs cool. You save power and fuel. You may save unnecessary repair bills. Do the job yourself. Or ask your garage or service station to flush your radiator for you. Insist on Sani-Flush. It cannot injure motor or fittings. You'll find Sani-Flush in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

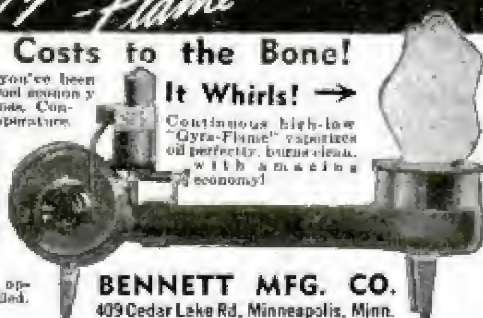
**Sani-Flush** *Safe* NOT CAUSTIC  
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## NEW BENNETT "Gyra-Flame" OIL BURNER

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**AGENTS:** Here's an opportunity seldom equalled. Write for details.



**BENNETT MFG. CO.**  
409 Cedar Lake Rd., Minneapolis, Minn.

## 2-406 Air-Crash Detectives

(Continued from page 541)

was a problem ship that contributed to the solving of several problems. The early models had a tendency to nose over after landing, the propellers had a tendency to fly apart, and even minor crack-ups became disasters, for the ship would burst into flames on the slightest provocation.

The nosing-over tendency was solved by placing the landing gear struts farther forward, spreading them to do away with the seesaw effect. Smaller metal propellers replaced the huge laminated wood props. And by crashing 200 of these planes against a concrete wall, it was discovered that the long exhaust stack, running outside the fuselage almost to the tail, often caused fires. This was remedied by providing each cylinder with its individual stub exhaust stack.

A few years ago the navy's NB-1 trainer and the army's P-12 pursuit planes were showing vicious spinning tendencies that cost several lives. To solve these problems the N. A. C. A. developed the free spinning tunnel. Today no airplane is ever constructed until a model of the type has been tested in this tunnel, and its spinning tendencies brought under control.

There are certain dependable clues that are always looked for in reconstructing an accident. Was the plane flying at full speed when it hit, or attempting a dead-stick landing? Did it spin in, dive in, or contact the ground in normal flight? In case of fire, did it originate in the air, or was it an aftermath of the crash?

If structural failure occurred in the air, the part that gave way in flight usually is missing from the wreck and may be found some distance away. The direction of the breakage is a sure clue. Anything that gives way in the air will break upward and back, if the plane is flying normally, for gravity and air resistance furnish the stress. Breakage on impact will be forward and down.

A recent crash proved this point. Inspectors noticed that the air liner's vertical fin and rudder were missing. Examination of the remaining tail structure disclosed that there had been severe vibration and bending of the fin to right and left before the parts pulled away to the rear. Flutter was immediately apparent



2-406  
as the cause of structural failure in the air, and within three hours all planes of that type were grounded until the tail structure could be re-designed. This accident resulted in a new type of machine for measuring vibration periods, and all planes now constructed are subject to tests by these machines.

Loss of a flying boat led to experiments to eliminate fire and explosion hazards while dumping gasoline. That such was the cause of this accident was determined from meager clues, for the plane sank completely with all on board. Among the bits of floating wreckage was the navigator's drift target tray, through which a piece of plywood flooring had been driven edgewise. This tray appeared to have been wetted on its exterior with gasoline, which then burned. This single clue would have been sufficient to prove fire and explosion. This accident resulted in relocating and redesigning of the fuel dumping valves.

A baffling accident occurred when an air liner, circling over water in normal descent for a landing, failed to come out of the glide and dived into a bay. When the wreck was raised, the wheels of both control columns were found bent backward, showing that both pilots had made tremendous, if unsuccessful, efforts to level off. Low on one control column the paint was scarred, showing that something had jammed between it and the base of the pilot's seat. The controls, together with all loose objects in the cockpit, were forwarded to the Crime Detection Laboratories at Northwestern University, where the scar was quickly matched with the radio microphone, which had lodged behind the control column when one of the pilots dropped it.

But weather, rather than fire, freak, or structural failure, causes most accidents today. Too many are the result of becoming lost, through the pilot's inability to identify properly the radio range leg on which he is flying. Experts are battling with this problem, but the field is still wide open to the independent inventor.

❏ Popular Mechanics Magazine can furnish the name and address of the maker of, or dealer in, any article described in its pages. If you wish this information, write to the Bureau of Information, inclosing a stamped, self-addressed envelope.



Made by Herbert Dallinger with a 4 x 5 Series B Graflex

## Of Course, Mr. Dallinger Used a GRAFLEX

Most outstanding pictures are taken with Graflex-made cameras! For amateurs and professionals alike depend upon them for those hard-to-get shots that win prizes and recognition. Eventually you, too, like Mr. Dallinger will own a Graflex American-made, Prize-Winning Camera. Why not make your selection now—at your Dealer's?

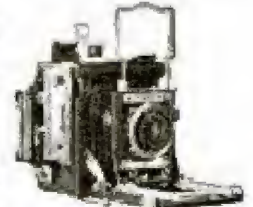


### R. B. Series B GRAFLEX

Here's the camera that made the unusual "stopped action" picture shown above. This camera has full-vision ground glass focusing, focal plane shutter with a wide range of speeds and revolving back for either horizontal or vertical subjects. Yet it is popularly priced. Three sizes:  $2\frac{1}{4} \times 3\frac{1}{4}$ ,  $3\frac{1}{4} \times 4\frac{1}{4}$  and  $4 \times 5$ .

### $2\frac{1}{4} \times 3\frac{1}{4}$ Miniature SPEED GRAPHIC

Now equipped with a new tubular view finder that corrects for parallax and uses interchangeable lens matching masks, this Miniature Speed Graphic is more versatile than ever before. And it features built-in focal plane shutter flash synchronization for picture-taking day or night! Other Speed Graphic sizes:  $3\frac{1}{4} \times 4\frac{1}{4}$ ,  $4 \times 5$  and  $5 \times 7$ .



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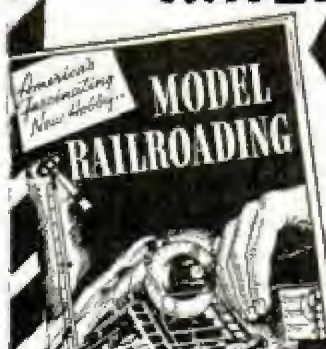
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KEYLESS — ELECTRIC GAS TANK LOCK**

Cap unlocks—SNAPS OPEN by pressing a BUTTON on DASH. Close the cap and it LOCKS AUTOMATICALLY. Now used as STANDARD FACTORY ACCESSORY by GRAHAM. Fully guaranteed. Exclusive sales territory granted. Write immediately to  
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The 1940 Constantine Catalog makes available most complete source of fine woods. Packed with valuable useful facts, some not previously published. Gives free loaning details of our new educational motion picture for woodworkers. All who work with woods need it. Send 10¢ stamp or coin today.

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**DEAL DIRECT — FACTORY PRICES**  
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Just couple your own energy to this unit, mount it on chassis and you have money making advantage of a portable welder at a saving of \$100 to \$500.



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AT HOBART'S RISK  
AND EASY  
"PAYS FOR ITSELF"  
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New low prices make this profitable welding service available to everyone. Opens doors to big pay jobs that carry real profit. Hobart Welders are easier to operate, faster, guaranteed to bring you quality welding business... extra profits will pay for welder without expense to you.

**NO INVESTMENT TERMS—PROFITS PAY FOR IT**

Extra earnings and savings possible with Hobart Welders make it easy to own without expense. You can even rent a new Hobart and later purchase it without loss. Coupon brings details.



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Gentlemen: Send me information on ( ) Build Your Own Welder ( ) Electric Drive Welder ( ) 30 Days Trial, Easy Terms ( ) Rental Plan. Also send me free books I've checked.

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## The War Horse Goes to College

(Continued from page 491)

mind them. Horses are social animals, with a strong tendency to follow the leader. The cavalry takes advantage of this trait; the rookie horse usually finds himself in the company of older horses, who nonchalantly do the things he is learning.

He is early accustomed to the sound of small-arms fire. There are usually rookie troopers learning to shoot, and the range is close enough that the horses hear the sound of firing. One morning the firing comes closer, while he is milling about in the corral with his fellow remounts and a leavening of older horses. A trooper fifty



*Troopers recover machine-gun ammunition dropped by parachute from plane during recent maneuvers*

yards away is firing blanks from a pistol. Other troopers are circulating among the horses, feeding them oats when they approach quietly. Finally the horse gets the idea that the noise, growing ever closer, is doing him no harm; and that he gets no oats as long as he kicks up a fuss.

After a session of this, the remounts are saddled, ridden along at a trot, then a gallop, while riders click strange black things called pistols close to their ears. And all the time that fellow in the distance, coming ever nearer, is shooting off blanks. The remount shies a bit at all this confusion, then remembers the association of noise with oats, gets his mind back on the business of obeying his rider. One morning the pistol near his ear roars instead of clicks, but by this time he pays no attention to the noise, even though the acrid fumes of smoke do tickle his nostrils.

The same way with the saber (now used only for exhibition purposes). The rider begins by partially withdrawing it from

(Continued to page 148A)



*... until I told them about the mysterious things I can do with my*

## New RCA ELECTRONIC LAB!"

RCA offers you two new Electronic Labs . . . With either of them, you can build your own radio . . . your own telegraph practice set . . . radio announce system and Magic Relay with which you can do many fun-full, fascinating things!

With the new RCA Electronic Labs you can build electrical devices, play with them, dismantle the parts and use them over again many, many times.

For example, you can build a radio receiver of your own. Or you can practice telegraph code on a telegraph practice set. You can hook a microphone into the family radio set and talk through it from another room. And with the Magic Relay, which you can also build, you'll have fun galore! It enables you to mysteriously ring bells, turn the radio on and off, and do many other unusual stunts.

The parts in the RCA Electronic Labs are similar to those used by famous radio engineers. Complete instructions make everything easy to build. And prices are as low as \$7.50. See these fascinating Labs at your RCA Victor radio dealer's—or any store where toys are sold. Big thrills await you.

For finer radio performance—RCA Victor Radio Tubes  
Trademark "RCA Victor" Reg. U.S. Pat. Off. by RCA Mfg. Co., Inc.

Put on your own radio dramas...with sound effects!

SEE NEW RCA SOUND CONTROL STUDIO



## ELECTRONIC LABS

### AND SOUND CONTROL STUDIO

By-Products Division

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A Service of the Radio Corporation of America



# PERSONAL

Are you the wise, far-sighted type that can smile while others boil? You are...and you can... if you use "Prestone" Brand anti-freeze. It does not boil away. Contains NO alcohol...NO glycerine.

(SEE PAGES 118A and 131A)

## Quick HEAT FOR EVERY HOME

**1 1/2¢ PER HOUR**



An Amazing New Radiant HEATER. Burns 96% air. Makes its own gas. No piping. No installation. Produces clean, healthful, penetrating heat like sunshine for 1 1/2 cents an hour. Hotter than gas or electricity. EASY TO OPERATE. No smoke, soot, ashes or odor. PORTABLE. **30 DAYS' TRIAL!** Write at once for special Introductory Low-Price Offer. TRY IT AT OUR RISK. Prove to yourself that you can have radiant heat at 1 1/2 cents an hour. No obligation. Write **AKRON LAMP & MFG. CO., 1200 High St., Akron, Ohio**

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Make Big Money!  
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for territory and  
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Make your Auto, Truck or Tractor Motor into a steady, even power unit for all kinds of work. Fits any make of engine. Money back guarantee. Price, postpaid..... **\$9.50**

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**"Keep a Jar or Tube of Lucky Tiger Ointment Handy"**

Made to allay Itching and Burning Feet—Crusty Scalps—Ringworm—Itchy Rectal Irritations—Insect Bites—Stings—Itchy Scalp—Externally-caused Pimples—Soothe fire and sunburns.

Get a jar at drug or 10¢ store or applications at barber shop.



**ANTISEPTIC FOR Inhibitory Use** when in proper contact—as in bandage or dressing for simple Cuts, Wounds, Scratches.

**FREE** 25¢ Trial Tube if you send us 6¢ in stamps to pay packing and postage.

**LUCKY TIGER MFG. CO.**  
Dept. 63 Kansas City, Mo.

(Continued from page 147A)

the scabbard, slapping it back. Finally he draws the weapon, waves it about, thrusts it slowly. Then the mount is ridden past dummies on the saber course, while the rider makes slow, quiet thrusts. Next day this will be repeated at a walk, then a trot, finally at a gallop; until the horse gets into the spirit of the thing, charges the dummy madly while the rider yells, carves the air close to his ears with the shining blade.

Jumps, too, are taken easily at first. They begin with nothing more than rails



*It is easier to train horses for high jumps than broad jumps. The animals are shy of ditches and holes*

on the ground, over which the horse is walked, then trotted. Soon the rails are placed higher, perhaps six inches off the ground, then a foot, two feet, three. Horses are allowed to approach these obstacles calmly, to study them, to jump by exertion rather than by flying leaps—this to develop the jumping muscles. When they clear the rails cleanly, they are introduced to jumps over hedges, oil drums, boxes. Only when they have been jumping easily for several weeks are they taken to the hurdle at a full gallop.

It is easier to teach a mount the high jumps than the broad. A ditch, three feet wide, eighteen inches deep, will frighten most horses at first. They are led over such obstacles at first, each rookie mount behind an experienced one. Only when they will jump with confidence when led are they ridden over. The ditches are increased in width and depth six inches at a

(Continued to page 151A)



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In Your Present Stove or Furnace—  
**HOTTER—No Drudgery,  
Dirt or Ashes—More Heat  
Quick at SMALL COST.**

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Prove its efficiency, convenience and economical operation.

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F. Silver says: "I can dispose of 250 HEAT KINGS before this year ends." Sample Burner FREE to producers. Write us now for agents' offer.

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ANY STOVE  
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**Quick HEAT At  
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Including 12 assorted blades, Adapters, Manual, and roller Saw Guide formerly found on expensive machines only. All metal, 15" long, 8" high, 6 1/2" wide. A swift and easy cutter—best ever made for the money.

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Drill Press, \$2.50; completely equipped Lathes, \$2 and \$4.00; Sander, \$1, etc. Order today or send card for Catalog.

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**Cleans Cars NEW WAY**

AMAZING INVENTION. Banishes auto-washing drudgery. Cleans interiors, woodwork, windows like a flash. Auto owners, housewives wild about it. New! Sells like wild! AGENTS WANTED EVERYWHERE. Hustlers cleaning up big money.

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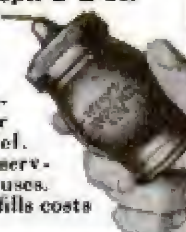
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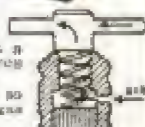


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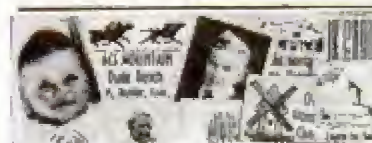
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CRAFTSMAN WOOD SERVICE CO.

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(Continued from page 148A)

time, from day to day, until all horses are clearing eight feet.

Fording and swimming are also matters of follow the leader. At fords, experienced horses are ridden into the water, and the remounts follow. For the first swimming lesson, older horses are swum to the other side, to give the rookies a goal. Then the riders row out in boats, tempting the remounts into the water with oats. Soon food is not needed for bait, the men riding into the water, dismounting, and swimming alongside with a hand on their mane.

In three months the remounts are turned over to troops, ready for any service. They are familiar with danger; and being creatures of habit, they are not afraid of it.

## Snow Cruiser to Explore Antarctic

(Continued from page 495)

of the opening, then slide its nose on the far side with front wheels drawn up and rear wheels furnishing power. As the front wheels touch "land," they will take over the job of pulling while the rear wheels are retracted and the tail slides on the snow. One man in the "second story" cabin will handle all controls. Below him is the repair shop; to the rear, navigation chart desk, engine room, galley which is also photographic darkroom, bunkroom, store-room and a compartment in the tail for two spare tires. The ski-mounted plane, carrying a seven-lens mapping camera, can be hauled to its perch by a winch or launched on the snow in ten minutes. Carbon black "bombs" will be dropped from the plane to mark its trail and act as reference points on photographs. The cruiser will have a 5,000-mile range, and will travel at from ten to thirty miles an hour under any conditions except severe blizzards. An automatic gyropilot may be installed to hold the cruiser on any course set. Front and rear wheels steer independently so that the Antarctic bus can turn in a thirty-foot radius or shift sidewise at a twenty-five degree angle. The scientists will measure thickness of the ice with the geophysical seismograph, make gravity determinations and meteorological observations, survey unexplored Antarctica and study the Aurora, terrestrial magnetism, meteors and other phenomena. Cruiser and equipment will cost about \$150,000.

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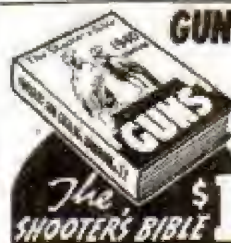
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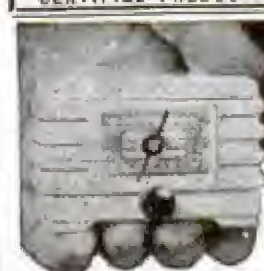
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## Watching Mother Earth's Pulse

(Continued from page 511)

The earthquake vibrations felt by man last from a fraction of a second to as much as forty seconds, as in the great San Francisco quake. Quakes in India have been said to last five minutes. Seismological instruments, however, record temblors long after man ceases to feel them—sometimes for hours.

The west coast of the United States lies within one of the two great earthquake belts that girdle the globe. One rims the Pacific Ocean from Chile, up through Mexico and California, across Alaska and the Bering Strait, down into Japan, the East Indies, New Zealand and the South Seas. The second great belt extends in a general line from Spain, through the Mediterranean, across the Himalayas to China.

The United States has suffered several memorable quakes including the Charleston, S. C., earthquake of 1886; San Francisco in 1906, Santa Barbara in 1925, Long Beach in 1933, and the Helena, Mont., quakes of 1935.

These disasters, however, were insignificant compared with major quakes in other parts of the world. The great Lisbon quake of 1755 killed 50,000 persons; the 1897 quake in Assam, India, covered an area of destruction of 160,000 square miles; and the great Japanese earthquake of 1923 took 250,000 lives.

Geologists have been trying to determine a method by which quakes can be predicted. "But as yet," declares Prof. Byerly, "there is no evidence to show that quakes can be forecast."

Sunspots and the relative positions of sun and moon are said to influence earthquakes, but such theories are largely hypothetical. Japanese scientists claim that a slight tilting of the earth's surface precedes a large quake. Four tilt-meters have been installed at the University of California to test this theory but not enough information has been yielded yet.

Even though earthquakes cannot be predicted, science feels that it is not wasting its time by watching the pulse of old Mother Earth. Fault lines may be located and avoided by builders. The effect of quakes on different types of soil has been discovered. Field observations and laboratory tests determine the best way to fortify skyscrapers and apartment houses against the sudden attack of temblors.

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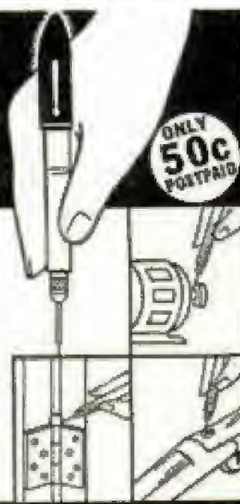


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Get yours TO-DAY on our MONEY-BACK trial.

Postpaid anywhere—\$2.25 each.

PARKER MFG. CO., 2024 N. Clark St., Chicago, Ill.

☐ Send C.O.D. I will pay Postman \$2.25 plus few cents postage.

☐ I enclose \$2.25 send Parker Lite postage prepaid.

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ADDRESS.....



**WILL YOU INVEST 10¢ TO LEARN ABOUT A BIG LAUNDRY SAVING?**

LINENE REVERSIBLE COLLARS are the convenient way to collar economy.

... Indispensable to office workers and uniformed men. ... Look neat and clean at all times. ... 12 different styles. ... Wear BOTH sides. ... Throw away when soiled. ... Use brand NEW collars all the time at less

expense than laundering old ones. ... Send a dime today for samples of two collars and style sheet. You can't lose. Be sure to state your size.

**REVERSIBLE COLLAR CO.,** 111 A Putnam Ave., Cambridge, Mass.

**Spiffy COLLAR STAY**

Prevents curling  
Prevents wrinkles

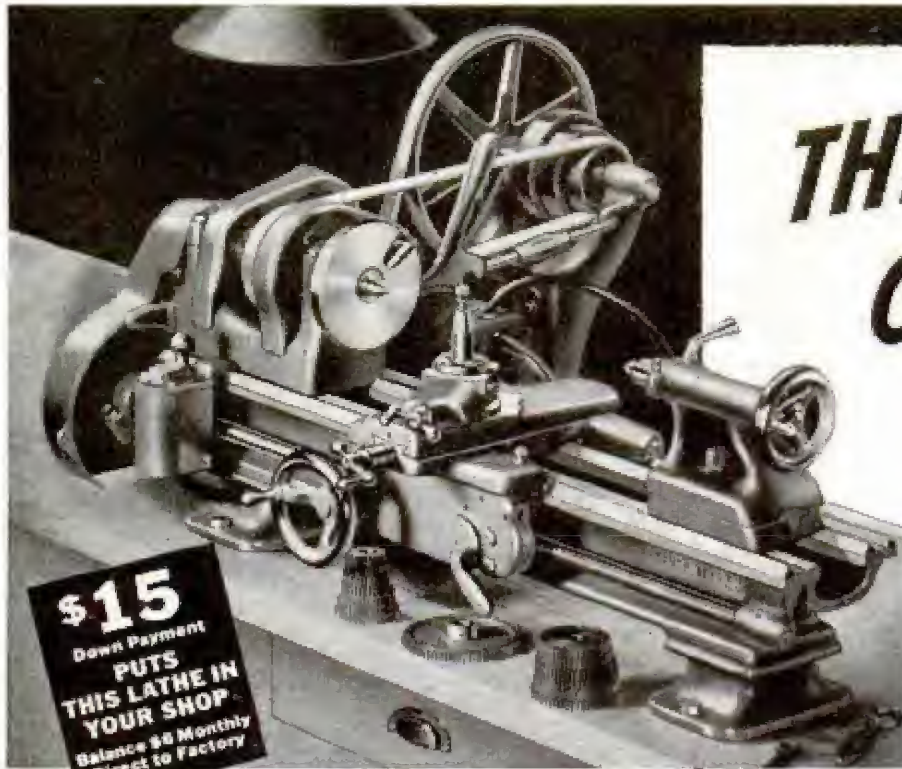
**SELF ADJUSTABLE AND INVISIBLE**  
GET A SPIFFY STAY today

It gives you that starched collar appearance with soft collar comfort. If your dealer cannot supply you, order direct. Send 25c (coin or stamp) for silver, 50c for Deluxe 24K Gold finish. State name and address of dealer who was unable to supply you and we will include free an attractive tie chain.

**CREST SPECIALTY CO.**  
661 W. Washington Street, Desk H, Chicago, Illinois

At Your Men's Shop or Jeweler



**\$15**

Down Payment  
PUTS  
THIS LATHE IN  
YOUR SHOP  
Balance \$6 Monthly  
Direct to Factory

Model C, 9 1/4" swing by 3' bed Workshop Bench Lathe with Motor Drive as shown. Shipping weight 320 pounds . . . . .

**\$127**

# THE BEST COSTS LESS

Only Good Shop  
Equipment Gives  
Satisfactory Service

## 9" Workshop Lathe

NOW AVAILABLE  
IN THREE MODELS

**MODEL A** — Power Cross and Longitudinal Feeds through friction clutch. Quick Change Gear Box.

**MODEL B** — Power Cross and Longitudinal Feeds through friction clutch. Plain Change Gears.

**MODEL C** — Power Longitudinal Feeds through Half-Nuts. Plain Change Gears.

### FEATURES

#### THAT INSURE ACCURACY AND LONG, DEPENDABLE SERVICE

1. Semi-steel lathe bed, heavily constructed.
2. Hand-scraped V-ways on lathe bed.
3. Heat-treated alloy steel headstock spindle with precision ground bearing surfaces.
4. All steel and iron construction.
5. Precision machine cut gears.
6. Precision lead screw cuts screw threads to most exacting tolerances.
7. Ball thrust bearing for spindle.
8. Twin gear reverse on headstock for right and left hand threads and feeds.
9. Precision graduated steel micrometer collars on cross feed screw and compound rest screw.

**L**OOK beyond the selling price when you buy a lathe, for the first cost must be divided by the number of years of satisfactory service to find the actual cost per year. Longer and more dependable service, greater satisfaction and lasting accuracy make the 9-inch Workshop Lathe unquestionably the greatest lathe value per dollar of cost. This back-g geared screw cutting precision lathe is an all-purpose tool, practical for instrument repair, invention development, tool and die making, special production operations, gunsmithing, electrical and radio service, laboratory work, model making and other precision metal working jobs.

#### Send Coupon for this shop information

**Catalog No. 46-B**—illustrates, describes and prices the 9" Workshop Lathe in Models A, B and C in 3', 3 1/4', 4', and 4 1/2' bed lengths. Free.

**How to Run a Lathe**—Most practical text and reference book on lathe work ever published. 128 pages, 300 illustrations. Over 1,500,000 copies sold. Price 25c postage paid.

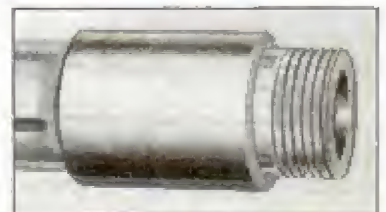
making, special production operations, gunsmithing, electrical and radio service, laboratory work, model making and other precision metal working jobs.

#### SOUTH BEND LATHE WORKS

646 E. Madison St., South Bend, Ind., U.S.A.



Hand-scraping the V-ways of a 9-inch Workshop Lathe Bed.



Heat-treated alloy steel headstock spindle with precision ground bearing surfaces.

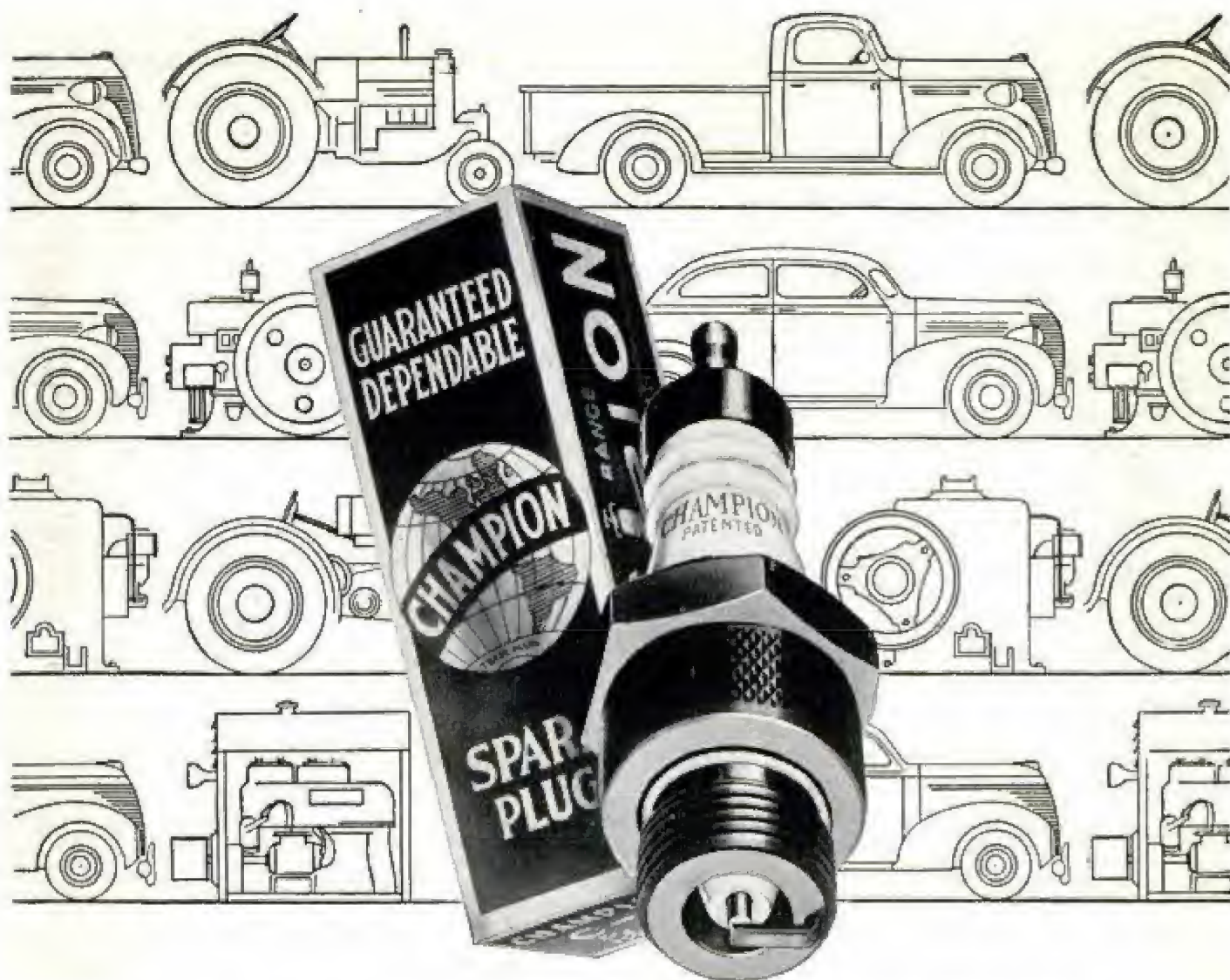
**SOUTH BEND LATHE WORKS**  
646 E. Madison St. South Bend, Ind., U.S.A.

☐ No. 46-B 9 in. Workshop Cat., Free  
☐ No. 34-LH, How to Run a Lathe, 25c  
☐ Easy Payment Plan

Class of Work \_\_\_\_\_  
Name \_\_\_\_\_ City \_\_\_\_\_  
Address \_\_\_\_\_ State \_\_\_\_\_

# SOUTH BEND Precision LATHES





## *By Any Standard* CHAMPIONS Are The Better Spark Plugs For Every Engine

The sound judgment so characteristic of mechanically minded men shows, in survey after survey, that Champion Spark Plugs are the predominant choice for all their engines. Furthermore, they show that these men fully appreciate the economic advantages of installing *new* spark plugs at regular intervals.

Champions make every engine a better performing engine due to many exclusive and patented features, the most recent of which is their new Sillment seal. This compressed dry powder permanently seals Champions against troublesome leakage common to ordinary spark plugs, banishes pre-ignition due to leakage, and insures uniform ignition and full power in every cylinder.

Maximum power, economy and dependability are the standards by which spark plugs are measured by particular owners of every type of engine, everywhere. By these, or any other standards, Champions are the better spark plugs—insist on them.

ACTUAL SIZE  
V-PLUG



V- $\frac{3}{8}$ " 24 Thread  
V2- $\frac{1}{4}$ " 32 Thread  
65c

### MODEL BUILDERS—ATTENTION!

Specially designed for model gas engines giving the same dependable performance as regular Champions. Absolutely gas-tight, alloy needle point electrode, one-piece construction. If not available through your dealer, write Champion Spark Plug Company, 900 Upton Ave., Toledo, Ohio.

USE THE SPARK PLUG CHAMPIONS USE



"When you like a cigarette the way I like Camels  
— it's mighty nice to get *more puffs per pack*"

*says Owen Harding, Veteran Maine Guide*



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OWEN HARDING, who knows his native Maine country like a book, also proves a good guide on cigarette quality, as he shares his favorite brand with Mr. and Mrs. Clifford Stanford, from New York City.

"Camels are a longer-burning cigarette," Owen says, "and that means *more smokin'* for my money. It means, too, that Camels taste cooler... milder."

**"PUFF FOR PUFF, CAMELS PUT MORE PLEASURE  
IN SMOKING AND A BIG EXTRA MEASURE OF IT"**

By burning 25% slower than the average of the 15 other of the largest-selling brands tested — slower than *any* of them — CAMELS give a smoking *plus* equal to



**5 EXTRA SMOKES  
PER PACK**

- 1** CAMELS were found to contain *more tobacco by weight* than the average for the 15 other of the largest-selling brands.
- 2** Camels burned *slower* than any other brand tested—25% slower than the average time of the 15 other of the largest-selling brands! By burning 25% slower, on the average, Camels give smokers the equivalent of *5 extra smokes per pack!*
- 3** In the same tests, *Camels held their ash for longer* than the average time for all the other brands.

Judge your cigarettes by the way they burn. Recent impartial laboratory findings confirm the experience of Camel smokers. Camels are known to burn longer, delivering more pleasure per puff—more puffs per pack. All the while you get the mild, ripe goodness of finer, more expensive tobaccos. Camels are the quality cigarette *every* smoker can afford.

*Penny for penny your best cigarette buy —*

**Camel—the cigarette of Costlier Tobaccos**